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The CANADIAN FIELD-NATURALIST

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Published by the

OTTAWA FIELD-NATURALISTS' CLUB

Entered at the Post Office at Ottawa, Ont., as second class matter.

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The Canadian Field-Naturalist

Vol. 64 OTTAWA, CANADA, JANUARY-FEBRUARY, 1950 No. 1

THE GENUS ANTENNARIA IN NORTHWESTERN CANADA[1]

A. E. Porsild
National Museum of Canada, Ottawa

IN NORTH AMERICA the taxonomy of the genus *Antennaria* is difficult and very complicated comparable perhaps to that of the likewise apomictic genera *Taraxacum* and *Hieracium* in Eurasia where, on the other hand, the genus *Antennaria* is simple.

Early botanists in North America paid scant attention to the genus and, generally, were content to refer American specimens to one of the three well-known Eurasian species: *A. alpina, A. carpatica* and *A. dioica.* As late as 1834, W. J. Hooker, in his *Flora Boreali-Americana,* recognized but six species, and in 1867, Asa Gray, in his *Synoptical Flora of North America,* no more than eleven.

During the last fifty years, the number of species of *Antennaria* recognized in North America has increased rapidly, so that today upwards of 200 species have been described. Moreover, it has been shown, largely by the studies of E. L. Greene, P. A. Rydberg and E. Nelson that the genus is predominantly Cordilleran, although the careful studies of M. L. Fernald, Morten P. Porsild, M. O. Malte, and others have shown that important centres exist also in the East, chiefly around the Gulf of St. Lawrence, Newfoundland, Greenland, and elsewhere, and that a single group, the broad-leaved grassland species: *Plantaginifoliae* extend across the Continent south of the transcontinental, boreal coniferous forest, with only two species, *A. campestris* and *A. Howellii,* entering the southern part of our area. A comparatively small number of species have a continent-wide range across arctic and sub-arctic North America whereas the majority of species are endemic to a given area.

Of the 32 species of *Antennaria* now recognized in the flora of Alaska, Yukon and Mackenzie district, all except *A. campestris* and *A. Howellii* belong in the sections: *Alpinae, Dioicae* and *Carpaticae* of which the first two are not too well differentiated. The *Alpinae* are essentially arctic-alpine, the other two sub-alpine and boreal, but not arctic. All are adapted to open, sunny habitats such as cliffs, rocky screes, alpine stream beds and alpine meadows; all avoid shady places and forests.

Early collectors brought back very few specimens of *Antennaria* from the Yukon but from the Bering Sea region of Alaska comparatively numerous collections exist, representing a small number of species that phytogeographically all belong in the Beringian or Pacific Coast element of the North American Flora[2] (*A. monocephala, A. pallida* and *A. dioica*). To these have lately been added a few species that are either endemic to the region, and belong with the Beringian element, or are widely distributed arctic North American species.

In the interior of Alaska, and especially as we move east and south into the Yukon, the *Antennaria* flora changes radically. The rich collections of recent years from mountains of Yukon show that we there have a complex flora of *Antennariae* which is more closely related to species in the Cordillera than to those of Beringia. Further studies of the still largely uncorrelated mass of species described in the last fifty years from the Rocky Mountains region, will undoubtedly disclose a still closer affinity.

In the field the writer has devoted much time to the study and collection of *Antennaria* in Central and Western Alaska, S. E. Yukon, Mackenzie, Keewatin and West Greenland as well as in Banff Park of the

[1]) Received for publication November 17, 1949.

[2]) Hultén, Outline of the History of Arctic and Boreal Biota during the Quarternary Period. Stockholm, 1937.

Vol. 63, No. 6, November-December, 1949, was issued November 23, 1949.

Canadian Rockies. In Southeastern Yukon no less than 22 different species were recognized in mountains adjacent to the Canol Road. Of these 22 species, 9 cannot be identified with known species and, therefore, have been described as new.

In my studies of the northwestern species of *Antennaria* I have been constantly inspired and guided by Professor Fernald's exhaustive and exemplary taxonomic monographs of the eastern members of the genus, and I have benefited equally from the researches of my father, Dr. Morten P. Porsild, whose life-long studies, particularly of the morphology of the genus, have made his friendly criticism particularly constructive and helpful.

In my present attempt to classify the species included in this treatment, I have found no new diagnostic characters, nor any that appear infallible; my present concept of species is based upon a series of often minute characters that, although somewhat variable in some species, nevertheless are fairly constant and make it possible to draw up recognizable descriptions and workable keys. I have, myself, collected and also studied in the field all the species discussed (except *A. atriceps*) and have found the experience thus gathered invaluable. In appraising the characters used I find that the growth habit is always dependable, but not always recognizable in poorly collected herbarium material. Thus, nearly all species here reckoned to the *Alpinae*, including *A. alaskana, A. angustata, A. compacta, A. densifolia, A. Ekmaniana, A. monocephala* and *A. subcanescens*, lack procumbent stolons and, therefore are sedentary, forming small tufts or compact cushions. Exceptions to this rule are: *A. atriceps, A. megacephala, A. pedunculata, A. philonipha* and *A. stolonifera*. All species here placed in the *Dioicae*, except *A. pygmaea*, have procumbent stolons which permit them to spread and form mats.

Equally reliable and constant is the presence or absence of papillae or "duplex hairs" on the achenes.[3] Other characters, such as the number of heads in the inflorescence, the height of the involucrum and the arrangement of its bracts, the presence or absence of glands on the bracts and peduncles, the shape of the leaves on the stolons and the texture of their indument, the shape and number of cauline leaves, and especially the presence or absence of their peculiar flat or twisted, scarious appendages, are most helpful once the collector has learned to evaluate their relative importance in a given species.

In the construction of a key the *Dioicae* are by far the most difficult because such characters as the shape, texture and colour of the phyllaries are somewhat variable within the species according to the state of development and also within a given population. Thus, amongst the monocephalic species the phyllaries of *A. pygmaea* may sometimes resemble those of the *Alpinae*. Amongst the pleiocephalic species the phyllaries of *A. elegans* are pink in youth but soon fade to pale grey. In *A. nitida* the outer phyllaries may be reddish brown in the young inflorescence.

Under each species are given references to pertinent literature in which the species is discussed for the area treated.

Only specimens which have been verified by the writer are cited, and with few exceptions only specimens from Yukon and Mackenzie are enumerated.

Where no herbarium symbol is given the specimen is deposited in the National Herbarium of Canada (Can.). Other symbols used denote: (S) National Herbarium of Sweden, Stockholm; (NY) Herbarium of the New York Botanical Garden; (US) United States National Herbarium, Washington, D.C.; (G) Gray Herbarium, Cambridge, Mass.

On the maps shown on Plates 1-3, I have spotted all stations known to me in Canada and Alaska for each species included in the present treatment. Each spot frequently represents a number of collections, all of which have been verified by me.

SECT. PLANTAGINIFOLIAE

1. **Antennaria campestris** Rydb. in Bull. Torr. Bot. Cl. 24:304 (1897); Raup in Journ. Arn. Arb. 17:305 (1936).

Low and creeping; the old stolons slender, funiliform, subterranean, freely branching with numerous sterile rosettes; young stolons of the year above the surface, flagellate, up to 10 cm long, issuing from the base of the fertile stems. Basal leaves obovate-cuneate, 2-3 cm long and about 1 cm wide, short-petiolate with one prominent median nerve and two indistinct lateral ones; the upper leaf-surface dark green and glabrate in age, the lower covered by a dense, permanent and

[3]See M. P. Porsild, Rhodora, 33 : 213-222 (1931).

KEY TO THE GENUS *ANTENNARIA* IN YUKON AND ADJACENT PARTS OF ALASKA AND NORTHWEST TERRITORIES.

A. Basal leaves prominently 3-nerved, erect, 4-16 cm long, similar to cauline leaves. (*CARPATICAE*).

3. *A. pulcherrima*
Nfld. to Alaska.

A. Basal leaves 1-nerved or at most with obscure and weak lateral nerves, 3-5 cm long but mostly less; cauline leaves reduced, usually ending in a scarious appendix.

B. Tall, broad-leaved plants; stolons of the year flagellate, ending in leafy rosettes; heads large, with involucres about 10 mm. high. (*PLANTAGINIFOLIAE*).

C. Basal leaves obovate-cuneate, distinctly petiolate, rarely over 3 cm long; flowering stems 10-25 cm tall, weak. Plant dioecious.

1. *A. campestris*
foothills and prairies
north to Slave Lake.

C. Basal leaves oblanceolate, gradually tapering toward the base, 3-5 cm long; flowering stems 25-35 cm high, stout. Staminate plant unknown.

2. *A. Howellii*
open alpine forests;
Oregon - Montana & Sask.,
north to S. E. Yukon.

B. Tall, medium or dwarf species; stolons of the year not flagellate, leafy throughout; heads smaller, with involucres less than 8 mm high (or, if over, small-leaved, dwarf species less than 15 cm tall: *A. angustata* and *A. megacephala*).

D. Bracts of the involucres (phyllaries) with pale greenish-brown to olivaceous or dark-brown, usually acuminate and erose tips. (*ALPINAE*).

E. Male and female plants usually present.

F. Involucres of pistillate heads small, 4-5 mm high.

G. Strictly monocephalous, densely tufted, lacking stolons, flowering stems rather low and stout.

12. *A. monocephala*
E. Asia, east to N. W.
Mackenzie,? Alberta
and B.C.

G. Heads normally 3-5, basal leaves oblanceolate, with well-developed, purple-tinged petioles, appressed tomentose on both surfaces.

5. *A. alaskana*
Alaska.

F. Involucres of pistillate heads larger, about 6 mm. high.

H. Plant strictly monocephalous, almost entirely glabrous; with long stolons.

16. *A. philonipha*
Alaska, Yukon and
N.W. Mackenzie.

H. Plant normally pleicocephalous, densely caespitose with stout rhizomatose caudex.

I. Basal leaves spatulate, 10-15 mm long, not imbricated, thinly appressed tomentose on both sides; achenes papillose.

13. *A. neoalaskana*
N. W. Mackenzie,
? Alaska.

I. Basal leaves densely imbricated, about 6 mm long; achenes glabrous.

9. *A. densifolia*
Mackenzie Mts.

E. Only female plant known.
J. Plant normally monocephalous, densely tufted, lacking stolons.

K. Inner phyllaries normally with blunt, pale straw-coloured tips. (*DIOICAE*).

29. *A. pygmaea*
Lab., Keewatin, Mack. and Yukon.

K. Inner phyllaries with attenuate olive-brown tips.

6. *A. angustata*
Lab., Keewatin, disjunct stations in Mackenzie and Alaska.

J. Plant normally pleiocephalous (dwarf plants of *A. megacephala* often monocephalous).

L. Plant caespitose with stout rhizomatose caudices and numerous sessile, sterile rosettes.

M. Basal leaves very narrowly oblanceolate, gradually tapering towards the apex; pappus somewhat rufidulous; achenes glabrous or minutely papillose.

10. *A. Ekmaniana*
Greenl. to Alaska, high-arctic-alpine.

M. Basal leaves spatulate-obovate, rounded at the apex; pappus white; achenes glabrous.

N. Basal leaves short obovate, white-lanate-tomentose; stems floccose; plant pulvinate.

8. *A. compacta*
N. W. Mackenzie-Alaska to S. E. Yukon; arctic-alpine.

N. Basal leaves longer, grey, thinly appressed tomentose; stems purple under the thin non-floccose tomentum; plant caespitose, but not pulvinate.

18. *A. subcanescens*
N. W. Mackenzie-Alaska; arctic-alpine.

L. Loosely caespitose with basal rosettes borne on normally well-developed prostrate or ascending stolons.

O. Achenes strongly papillose, even when immature; heads 4-10 with involucres 6-7 mm high.

P. Inflorescence rather compact; inner phyllaries dark brown.

17. *A. stolonifera*
S. E. Yukon, ? Rock. Mts.

P. Inflorescence open, the lower heads remote, on long peduncles; inner phyllaries pale brown.

15. *A. pedunculata*
S. E. Yukon-N. E. Alaska.

O. Achenes glabrous.

Q. Heads large, 1-5, with involucres 7-10 mm high.

R. Heads 1-3; stolons very short and plant forming small, compact tufts.

11. *A. megacephala*
N. British Columbia - S. E. Yukon.

R. Heads 1-5; loosely caespitose with well-developed stolons.

7. *A. atriceps*
N. British Columbia.

Q. Heads smaller, 3-5, with involucres 6-7 mm high; loosely caespitose, with well-developed stolons.

14. *A. pallida*
E. Pacific Coast, west to Aleut. Isl.

D. At least the inner phyllaries with papery, white, straw-coloured or pink, and usually spatulate-ligulate tips; in our area only the female plants known. (*DIOICAE*).

a. Inner phyllaries pink (in *A. elegans* soon becoming pale grey or straw-coloured.)

b. Tall plants with fruiting stems usually 20 cm or over.

c. Plants with well-developed stolons, forming colonies.

d. Basal leaves fresh green, glabrate above; cauline leaves ample; fruiting stems 20-30 cm high; heads showy, nodding in youth.

19. *A. alborosea*
Centr. Alaska-Yukon, Mack.; ? mts. of Alberta and British Columbia

d. Basal leaves neither fresh green, nor glabrate above, cauline leaves reduced.

e. Basal leaves narrowly spatulate, appressed sericeous-tomentose; phyllaries pale pink only in youth, soon becoming pale grey or straw-coloured.

22. *A. elegans*
S. E. Yukon, Bear Lake.

e. Basal leaves oblanceolate, dull greyish tomentose; phyllaries pink, even in age.

30. *A. rosea*
S. E. Yukon, south through Rc. Mts., east to James Bay.

c. Plants with short, sessile offsets, forming small tufts; basal leaves spatulate-obovate, with appressed grey tomentum.

28. *A. oxyphylla*
Centr. Alaska-Yukon, east to Lake Athabaska south to Nebraska and S. Dakota.

b. Dwarf plants with fruiting stems less than 20 cm high.

f. Heads nodding in youth; plants of low, matted growth, basal leaves short, spatulate-obovate, sessile, somewhat crowded, ashy-grey, in age becoming glabrous above; achenes sparingly, but distinctly papillose.

20. *A. Breitungii*
Centr. Alaska & Yukon.

f. Heads not nodding in youth; basal leaves erect, oblanceolate, sericeous-tomentose.

23. *A. incarnata*
S. E. Yukon.

a. Inner phyllaries papery white or straw-coloured, never pink (in *A. leuchippi* with purple spots visible only under a lens).

g. Tall plants with fruiting stems usually 20 cm high or over, with long, trailing stolons.

26. *A. leuchippi*
S. E. Yukon.

g. Dwarf to medium plants with fruiting stems usually under 20 cm.

h. Monocephalous; densely tufted; flowering stems rarely over 10 cm; basal leaves small, rarely over 10 mm long.

29. *A. pygmaea*
Lab., Keewatin, Mack. and Yukon.

h. Inflorescence pleiocephalous, usually with from 4-10 heads.

i. Heads nodding when young, inflorescence glomerulate, phyllaries firm, papery, white.

j. Cauline leaves all without scarious tips; basal leaves densely canescent tomentose.

25. *A. Laingii*
Centr. Alaska,
S. E. Yukon.

j. Upper 1-3 cauline leaves with slender, scarious tips; basal leaves appressed sericeous-tomentose, almost silvery.

27. *A. nitida*
Centr. Alaska-Yukon east to James Bay, in Rc. Mts. and foothills south to N. Mexico.

i. Heads not nodding in youth; inflorescence open, with the lateral heads pedunculate; phyllaries rather thin and soft, their tips often spreading in age.

k. Pappus pale rufidulous; plant pulvinate with short sessile, erect offsets.

21. *A. crymophila*
Mackenzie Delta.

k. Pappus white; plant not pulvinate.

l. Upper 1-3 cauline leaves with slender, scarious tips.

31. *A. subviscosa*
Gaspé, Que. and
S. E. Yukon.

l. Upper 5-8 cauline leaves with broad, flat and very prominent scarious appendages.

24. *A. isolepis*
Lab. - Alaska.

yellowish-white felt. — Flowering stems slender, from 10-25 cm tall, bearing from 5-10 much reduced, scarious-tipped leaves. Inflorescence dense, glomerulate; pistillate heads large from 2-5, their involucres about 10 mm high; phyllaries indistinctly 3-seriate, linear-lanceolate, greenish-brown and lanate at the base, with long-acuminate, papery, white tips; pappus tawny; mature achenes olivaceous, shiny and distinctly papillose. — Staminate heads somewhat smaller, with obtuse-erose, more or less reflexed tips. With *A. Howellii* the only species in the section *Plantaginifoliae* which reach north into our area.

Specimens seen: MACKENZIE DISTRICT: North shore of Slave Lake, C.F. Howe, Can. *104944*.

General distribution: A grassland species characteristic of dry, sandy plains and prairies: Interior British Columbia and Rocky Mountain foothills north to Slave Lake east to north shore of Lake Superior, south to Kansas.

Type locality: "Prairies and plains west of Mississippi", Nebraska — S. Dakota.

Illustration: Britt. & Brown, Ill. Fl. N. States and Can. ed. 2. 3:452 (1913).

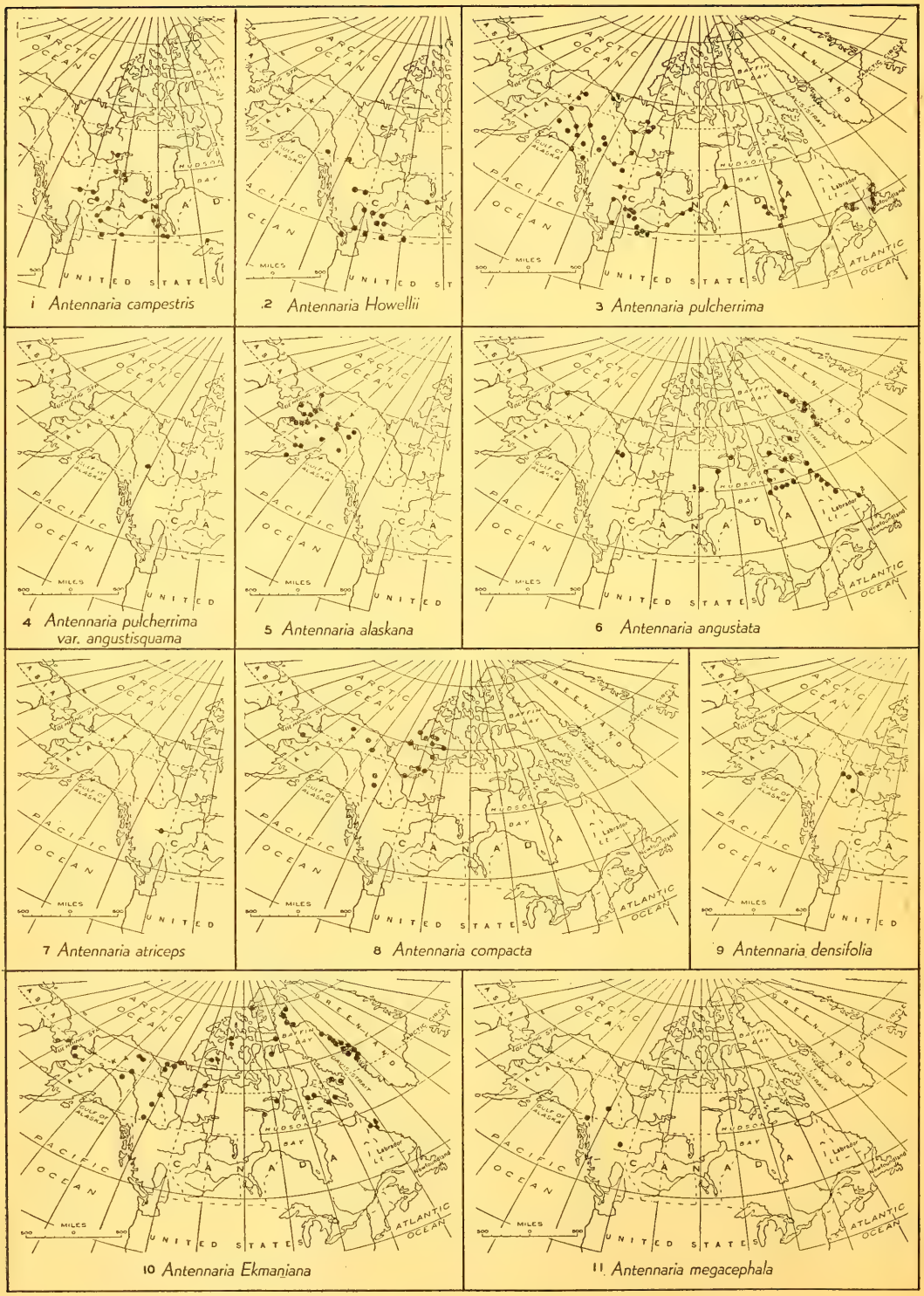

Plate 1. Distribution of **Antennaria** in Northwestern Canada.

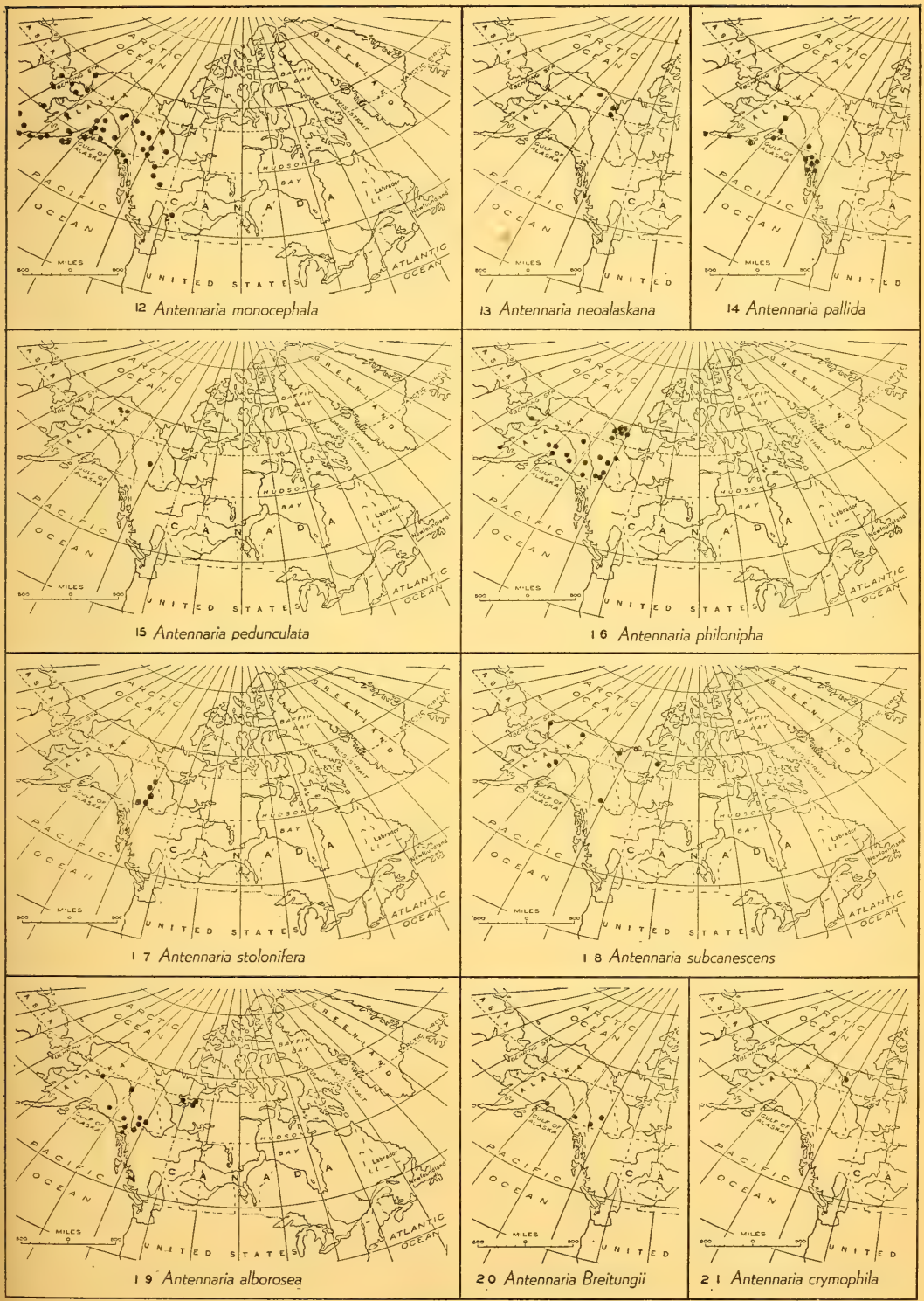

Plate 2. Distribution of Antennaria in Northwestern Canada.

2. **Antennaria Howellii** Greene in Pitt. 3:174 (1897) and *ibid.* 276 (1898)

Humifuse; the old stolons stout, funiliform, woody, subterranean, freely branching and terminating in large, leafy rosettes; young stolons of the year flagellate but much stouter than in *A. campestris,* up to 10 cm long, issuing from the base of the fertile stems. — Rosette leaves 3-5 cm long and 1-2 cm wide, oblanceolate, gradually tapering toward the base, cuspidate-mucronate, fresh green and in age glabrous above, permanently white-tomentose and distinctly featherveined below. — Mature flowering stems 25-35 cm high, stout, greenish-purple under the thinly lanate tomentum, bearing about 10 leaves, the lowermost ample, 3-4 cm long and 3-4 mm wide, linear-oblong, acuminate, the uppermost rapidly diminishing in size and ending in narrow, scarious tips. — Inflorescence nodding in youth, cymose, open and much branched, with 6-8 large heads, the lateral ones often on up to 10 cm long peduncles and overtopping the central part of the inflorescence; involucres about 10 mm high; phyllaries 3-seriate, linear-lanceolate, greenish-brown and lanate below, with long-attenuate, tawny and papery tips; pappus tawny; styles much exserted; mature achenes about 1.8 mm long, narrow and strongly papillate. Staminate plant unknown.

Antennaria Howellii of the section *Plantaginifoliae,* is a Cordilleran species which apparently extends north through mountains of northern British Columbia into S.E. Yukon. It is a species of open mountain forests rather than of dry grassland and is larger and more robust than *A. campestris.*

Specimens seen: YUKON: Watson Lake, Anderson & Brown, *9938* (Can & S); Alaska Highway, Rancheria west of Whitehorse, Anderson, *10501* (S).

Type locality: Mt. St. Helen, Oregon.

General distribution: Wooded slopes: Oregon, Idaho, Montana, east to Cypress Hills, Sask., north through mountains of Washington, British Columbia and Alberta to S.E. Yukon.

SECT. CARPATICAE

3. **Antennaria pulcherrima** (Hook.) Greene in Pitt. 3:176 (1897). — Britt. & Rydb. in Bull. N.Y. Bot. Gard. 2:185 (1901); Ostenfeld in Gjoa Exp., Kria. Vidensk. Selsk. p. 67 (1910); Porsild, in Nat. Mus. Can. Bull. **101**:32 (1945); Raup in Sargentia 6:244 (1947).

A. carpatica var. *pulcherrima* Hook., Fl. Bor.-Am. 1:329 (1834).

A. eucosma Fernald in Rhod. 13:23 (1911).

Tall, sericeous-tomentose plants which, besides having a true rhizome are stoloniferous and form small and rather compact tufts; stolons 3-8 cm long, slender, subterranean, ascending, bearing a tuft of erect terminal leaves. Flowering stems solitary, slender, sericeous-tomentose, 20-50 cm high, leafy; stem leaves 8-12, the lower 4-12 cm long and 0.8-1.4 cm broad, oblanceolate, acute, long-petiolate, prominently 3-5-nerved, sericeous-tomentose on both surfaces, pale grayish-green, in age becoming greenish-yellow; the upper linear, rapidly diminishing in size, and the uppermost bearing small, scarious tips.— Inflorescence glomerulate in youth, in age becoming open and expanded, with 4 to 12 heads, usually two or three on each branch. Pistillate heads large, involucres 7-8 mm high; bracts 3-seriate, dark brown and lanate at the base, with obtuse, scarious and pale brown tips. Pappus pure white; achenes glabrous. The staminate heads similar but slightly smaller; the tips of their bracts papery white, often reflexed; pappus bristles clavellate.

A strikingly tall and handsome species which usually grows on well-watered alluvial soils on river flats and meadows or on alpine slopes, and probably always on calcareous soil.

Specimens seen: MACKENZIE DISTRICT: West Coast of Bear Lake, Bell, *22928;* North shore Dease Arm, Porsild & Porsild, *4724;* McTavish Arm, *idem, 5188;* Leith Pt., *idem, 3559* & *3598;* Bear R., *idem, 3274;* Lone Mt. near mouth of N. Nahanni R., Wynne-Edwards, *8520.* YUKON: Pelly Range, Porsild & Breitung, *9812, 9813, 10025, 10088, 10867;* Kluane Lake, Anderson, *9359* (S, Can); White R., *idem, 9348;* 30 Mile R. Aug. 23, 1899, Williams (NY). Doubtfully recorded from the arctic coast of Yukon, King Pt. (Ostenfeld).

Type locality: "Swamps of the plains among the Rocky Mountains. Drummond".

Illustration: Marie-Victorin in Contr. Lab. Bot. Univ. Montr. 13:72, (1929) fig. 38.

General distribution: Boreal-alpine, but not arctic: Central Alaska, Yukon and Mackenzie north to the south slope of Endicott Range and to Bear Lake, south to Colorado and Washington, east to James Bay and the east coast of Hudson Bay to Richmond Gulf, with isolated stations on the north shore of the Gulf of St. Lawrence, Anticosti Island and on western Newfoundland (*A. eucosma* Fern.).

4. **Antennaria pulcherrima** (Hook.) Greene var. **angustisquama** A. E. Porsild, n. var.

A specie typica differt foliis attenuatis glabratis, calathiis femineis imis valde remotis et longe pedunculatis, involucri bracteis angustioribus longe attenuatis apice atro-viridibus; varietatis planta mascula ignota.

The var. *angustisquama* differs from the species in so many and important characters that, were it not for the fact that but one single colony of about 50 individuals could be found, the writer would be inclined to consider it distinct. No specimens connecting it to the species were seen elsewhere, nor has the writer seen such in the large material of *A. pulcherrima* in the National Herbarium of Canada, the Gray Herbarium or the U.S. National Herbarium.

Specimens seen: S.E. YUKON: Pelly Range, Canol Road, upper Rose R. on alluvial flats, elevation 3600 feet, July 12, 1944, Porsild & Breitung, *10413* (type).

General distribution: Known only from the type locality.

SECT. ALPINAE

5. **Antennaria alaskana** Malte in Rhod. 36:107 (1934); Steffen in Beih. Bot. Centralbl. 58, Abt. B:104, fig. 1 (1938); Porsild in Rhod. 41:292 (1939); Scamman in Rhod. 42:340 (1940).

Caespitose with a short, branched caudex and numerous sessile and leafy offsets. Basal leaves narrowly spatulate-oblanceolate from 1.5 to 3.0 cm long and from 2 to 4 mm wide, the blade tapering gradually into a narrow and often purplish tinged petiole, cinereous-tomentose on both sides, prominently mucronate; cauline leaves 4-6, floccose-lanate, linear, with a short, scarious tip.

Flowering stems 3-15 cm high, floccose, somewhat flexuous; heads small, from 3-5, usually densely clustered or sometimes the lowermost remote. Pistillate heads larger than the staminate ones, their involucres 4-5 mm high, densely imbricated, sparingly lanate or glabrate, greenish-brown at their bases, and with long-acuminate, olivaceous tips; pappus tawny; achenes glabrous. Staminate heads smaller, their bracts with prominent dark centre and obtuse, papery, often reflexed tips and with clavellate pappus bristles.

Antennaria alaskana is a very well marked species which apparently is endemic to volcanic hills of the Bering Sea region and central Alaska. Characteristic of the species, besides the small dioecious heads, are the spatulate-oblanceolate basal leaves with narrow, purplish petioles. In habit the plant resembles *A. Ekmaniana* but, unlike it, is dioecious, has smaller heads and perfectly glabrous achenes.

Type locality: "Alaska: near Port Clarence".

Illustration: Steffen, *l. c.*

General distribution: America: Bering Sea region and high mountains of central Alaska.

6. **Antennaria angustata** Greene in Pitt. 3:284 (1898); Porsild in Sargentia 4:68 (1943).
A. glabrata f. *tomentosa* Ekman in Sv. Bot. Tidsk. 21:5 (1927) tab. 1, fig. 9.
A. nitens Greene in Ottawa Nat. 25:42 (1911).
A. congesta Malte in Rhod. 36:114 (1934).
A. hudsonica Malte in Rhod. 36:116 (1934).
A. compacta sensu Polunin in Nat. Mus. Can. Bull. 92:347 (1940), not Malte.
A. Ekmaniana sensu Porsild in Nat. Mus. Can. Bull, 101:27 (1945); Raup in Sargentia 6:243 (1947), not *A. Ekmaniana* Porsild in Sargentia 4:69 (1943).

Caespitose with sessile or subsessile, erect basal offsets. — Basal leaves narrowly oblanceolate, about 10 mm long and 2 mm wide, mucronate, appressed-tomentose beneath, glabrate or even glabrous above. — Flowering stems 4-10 (14) cm high, thinly floccose-tomentose, bearing from 7-11 linear leaves; these about 10 mm long with prominent, flat scarious tips. Heads large, solitary or very rarely with one or two small lateral ones; involucres 8-10 mm high, thinly lanate at the base; the phyllaries obscurely 3-seriate, long-attenuate, olivaceous; style included or short-exserted; pappus white; achenes glabrous, about 1.4 mm long. The staminate plant not known.

An eastern arctic species frequenting slopes and depressions where the snow remains late. The long list of synonyms shows that *A. angustata* has been variously interpreted or misunderstood by different authors. The reason for this is largely that much herbarium material of *Antennaria*, as represented in the herbaria, is not well collected and therefore often misleading. *A. angustata* actually is very well marked by its tufted, caespitose habit, short basal leaves, large and mostly solitary heads and by its acuminate, dark or olivaceous tips of the phyllaries.

Specimens seen: MACKENZIE DISTRICT: Mackenzie Mts., Canol Road, Plains of Abraham, elev. 6000', Porsild & Breitung, *11823;* mountain range west of Bolstead Cr., Wynne-Edwards, *8385.* Both are over mature

specimens and were erroneously recorded as *A. Ekmaniana* (Porsild, 1945).

Type locality: "Hudson Strait".

General distribution: Arctic-alpine: West Greenland between 66° — 72° lat. N., northern Labrador, southern Baffin Island and with isolated, disjunct stations in Keewatin, Mackenzie, the arctic coast of Alaska south to high mountains of the Canadian Rockies.

Illustration: Ekman, l.c., as *A. glabrata* f. *tomentosa*.

7. **Antennaria atriceps** Fernald in Raup in Contr. Arn. Arb. 6:207 (1934) tab. VIII. 2.

Low and creeping with leafy stolons 4.5 cm long. Basal leaves oblanceolate or narrowly cuneate-spatulate, sericeous-tomentose on both surfaces, 0.5-1.5 cm long and 2-3.5 mm wide, prominently mucronate, the mucro 0.5-1 mm long, often claw-like. Flowering stems 0.5-1 dm high. Stem leaves 7-11; the lower oblanceolate, obtuse, mucronate; the middle and upper ones linear, 1-1.7 cm long with oblong, 2-3 mm long, scarious tips. Inflorescence cymose, heads 1-5. The involucres turbinate-cylindric, 8-10 mm high, with a greenish and more or less lanate base; phyllaries 3-seriate, blackish-brown, very thin, the outer ones oblong, acute, the inner ones oblong-lanceolate 0.8-1.3 mm wide with acuminate almost awn-like tips. Corolla 5 mm long with purpurescent lobes. Style much exserted, yellowish, becoming brownish. Achene 1.4 mm long, glabrous. Male plant unknown.

Type locality: Mt. Selwyn, northern British Columbia, Raup 4134 (Can., G.). Illustration: Raup, l.c.

General distribution: Thus far known only from the type locality.

8. **Antennaria compacta** Malte in Rhod. 36:111 (1934); Porsild in Sargentia 4:69 (1943). *A. candida* sensu Macoun & Holm in Rept. Can. Arct. Exp. 5A:21, 1921, not Greene.

Densely caespitose with numerous densely crowded, erect or suberect basal offsets. Basal leaves broadly oblanceolate-obovate, obtuse, 0.4-0.8 cm long and 0.3-0.4 cm wide, gradually tapering towards the narrower petiole, densely appressed canescent-tomentose on both surfaces, the tomentum almost completely covering the small but distinct mucro at the tip of the leaf. — Flowering stems 5-10 cm high, slender and often more or less arched, copiously and conspicuously floccose-tomentose; leaves 5-9, oblong-lanceolate-spatulate about 1.0 cm long and 0.2 cm wide, the lower obtuse, the upper with 2-3 mm long, scarious tips. Pistillate heads (1) 2-4, cymose. Involucre 6-7 mm high with densely lanate base. Phyllaries 2-to-3-seriate, subequal, the outer ones oblong, dusky brown, in age becoming tawny; the inner narrower, olivaceous with attenuate, erose tips. Corolla lobes purple. Style barely exserted, bifid. Pappus white. Achenes glabrous, 1.5 mm long. Male plant unknown.

Antennaria compacta, as the name implies, forms small, flat, compact cushions which rarely exceed 5-10 cm in diameter. It differs from *A. Ekmaniana* by its growth habit and by its broad, short and oblanceolate, densely crowded basal leaves, and by its copiously floccose flowering stems and by its glabrous achenes; from *A. subcanescens* by its densely tomentose basal leaves and floccose stems.

A well-marked arctic-alpine species of dry gravelly and rocky places which, apparently, is endemic to the Western Arctic and which has been erroneously recorded from the eastern Canadian Arctic and from Greenland.

Specimens seen: NORTHWEST TERRITORIES: Victoria Island, Porsild *17333-5, 17419, 17499;* Banks Isl., Porsild *17600.* Mackenzie District: Arctic Coast: Bernard Harbour, Johansen Can. *91545* (type); Cape Dalhousie, Porsild & Porsild *2801;* Bear Lake, idem, *4853, 5210;* Bear R., Mt. Charles, idem, *3306.* YUKON TERRITORY: Pelly Range, Porsild & Breitung, *11012* & *10192;* Mt. Sheldon, idem, *11098, 11642* & *11756;* Old Crow R. June 26, 1926, O. J. Murie (S).

Type locality: Arctic Coast, Bernard Harbour.

General distribution: Arctic-alpine: Arctic Coast from Bering Strait east to Coronation Gulf, south to Bear Lake, and high mountains of the Mackenzie and Pelly Ranges.

9. **Antennaria densifolia** A. E. Porsild in Nat. Mus. Can. Bull 101:26 & 32 (1945); Raup in Sargentia 6:243 (1947).

Densely caespitose, with short crowded, sessile or subsessile basal offsets. Basal leaves densely congested or imbricated, cuneate-obovate or broadly oblanceolate, obtuse, not mucronate, 0.5-0.6 cm long, 0.3 cm broad, densely and yellowish tomentose on both surfaces. — Flowering stems 6-9 cm high, slender, floccose-tomentose; stem leaves 5-7, close together, linear, the lowermost 0.6-1.0 cm long and 0.2 cm broad, acute, with subulate tips; the upper smaller and bearing scarious, lanceolate appendices. — Pistillate heads 2-4, campanulate, cymose, on 0.5 cm long pedicels; involucre 0.5 cm high, densely lanate at the base; phyllaries 2- to 3-seriate, subequal, lanceolate, subacute; the exterior chestnut-

brown, greenish at the base; the interior brownish, erose; corolla lobes purplish; style exserted, bifid; pappus white; achenes glabrous. — Staminate heads smaller, with 0.4 cm high involucres; phyllaries broadly oblanceolate, subequal and spreading; pappus bristles plumose somewhat clavellate toward the tip.

Antennaria densifolia superficially resembles depauperate specimens of *A. compacta* from which it differs by its shorter and more densely crowded leaves, and by being dioecious.

Specimens seen: MACKENZIE DISTRICT: Great Bear R., summit of Mt. Charles, Porsild & Porsild, *3347;* Mackenzie Mts., Canol Rd. Mile 174 E., Porsild & Breitung, *11881;* Mountain range west of Bolstead Cr., 6000' elev., Mile 111 E., Wynne-Edwards, *8384* (type); North peak of Nahanni Mt., *idem, 8521.*

General distribution: An apparently well-marked endemic of western Mackenzie district, inhabiting dry, calcareous alpine summits.

10. **Antennaria Ekmaniana** A. E. Porsild in Sargentia 4: 69 (1943).

A. angustifolia El. Ekman in Sv. Bot. Tidskr. 21: 53, tab. 1, figs, 1, 2 and 12 (1927), not Rydberg in Bull. Torr. Bot. Cl. 26: 546 (1899).

Densely caespitose with sessile or subsessile, erect basal rosettes; their leaves 1.0-2.2 cm long, 0.2-0.3 cm wide, linear-lanceolate, distinctly mucronate, densely appressed—tomentose on both sides, and usually somewhat purplish tinged at the base. — Flowering stems 10-20 cm high, distinctly purplish tinged under the thin, appressed tomentum, bearing from 6-8 linear, long-appendiculate, thinly lanate-tomentose leaves. — Pistillate heads from 1 to 7, but usually 3-4; involucres about 7 mm high, thinly lanate at the base; phyllaries, subequal, the outer ones lanceolate, olive-green, the inner long-attenuate, light chestnut-brown; pappus subrufescent; style exserted, deeply cleft; achenes glabrous or minutely papillose. Male plant unknown.

Antennaria Ekmaniana is the most arctic member of the genus and appears to be restricted to non-calcareous soils. In Alaska-Yukon it is generally found only on rocky, lichen-covered slopes, above timberline.

Specimens seen: MACKENZIE DISTRICT: Bear Lake, Porsild & Porsild, *5319;* Arctic Coast, Coppermine R., Porsild, *17185;* Atkinson Pt., Porsild & Porsild, *2668;* east of Kittigazuit, *idem, 2525;* 60 miles east of Tuktuayaktoq, Porsild, *16772;* Kittigazuit, Porsild & Porsild, *2401;* Mackenzie Delta, Richards Island, Porsild, *7455, 16793, 16857; ibid.,* Porsild & Porsild, *2123, 2288* and *2288b.* S.E. YUKON: Pelly Range, Porsild & Breitung, *9954, 11011;* Macmillan Pass, *idem, 11271.*

Type locality: West Greenland.

General distribution: High arctic-alpine. From northern West Greenland across Baffin Island, northern Ungava, Keewatin, Mackenzie and the Arctic Archipelago west to high mountains of Yukon and Alaska.

Illustration: Ekman, l.c., as *A. angustifolia sensu* Ekman.

11. **Antennaria megacephala** Fern. in Raup in Contr. Arn. Arb. 6:208 (1943), tab. ix.

Humifuse; stolons densely leafy, short and suberect, their leaves spatulate-obovate or broadly oblanceolate, prominently mucronate, 0.8-1.2 cm long, 0.3-0.4 cm wide, thinly appressed tomentose, the upper surface glabrescent in age. — Flowering stems 5-12 cm high, thinly floccose-tomentose, bearing 5-9 closely spaced, 1.0 cm long, linear leaves, all with prominent, 2-3 mm long, scarious tips.— Pistillate heads 1-3; involucres 0.8-1.0 cm high, thinly lanate at the base; phyllaries 3-seriate or subsequal, all dark green or olivaceous, the outer ones somewhat spreading, the inner ones oblong-linear, about 2 mm. wide, with blunt, erose tips; style barely exserted, bifid; pappus bristles white; achenes 1.4 mm long, glabrous. — Male plant not known.

The type of *A. megacephala* which came from mountains of northern British Columbia and consisted of dwarf, monocephalic specimens led Professor Fernald to compare his new species with the strictly monocephalic *A. monocephala* and *A. angustata.* In the large colonies of *A. megacephala* found by the writer on high, alpine slopes of the Pelly range in S. E. Yukon, the larger and more vigorous plants have flowering stems measuring 10-12 cm in height, each bearing from 2 to 3 heads, whereas dwarf plants are mostly monocephalic. In all other respects the Yukon plant is a close match for the type. Characteristic for *A. megacephala* are the large heads with broad, blunt, dark-green or olivaceous phyllaries and the unu-

sually long, scarious tips of the upper cauline leaves.

Specimens seen: NORTHERN B.C.: Mt. Kenny, 5800', Mrs. J. Norman Henry, *286* (type), (Phila. Acad., G); White Pass, Malte, *65*. S. E. YUKON: Pelly Range, Porsild & Breitung, *10153* and *10091*.

General distribution: High, alpine slopes and summits of Northern British Columbia and S. E. Yukon.

Illustration: Raup, l.c.

12. **Antennaria monocephala** DC., in Prod. 6:269 (1837). — Porsild in Nat. Mus. Can. Bull. 101:27 (1945); Raup in Sargentia 6:243 (1947).

Dwarf, often forming small mats although the offsets are rarely more than a few centimetres long, erect or suberect; their leaves spatulate-obcuneate toward the base, about 1 cm long, mucronate, thinly floccose-tomentose beneath, green and glabrous above. — Flowering stems usually about 5 cm high but often only 2 and occasionally up to 15 cm high, bearing from 5-10 thinly lanate, linear leaves with prominent, 2 mm long, scarious tips. — Heads always solitary; involucres about 4 mm high; phyllaries of the pistillate heads, green at the base, dark brown to almost black in the middle and olivaceous to golden brown towards the attenuate tips; pappus bristles white; style long-exserted; achenes glabrous. Staminate heads slightly smaller, their phyllaries broadly lanceolate, with papery, obtuse and often spreading tips; pappus bristles clavellate.

A common species above timberline on pre-Cambrian rocks where it is ubiquitous in snow-patch vegetation, ravines and avalanche paths.

Specimens seen: NORTHERN BRITISH COLUMBIA: Mt. Selwyn, Raup & Abbe, *3969;* Alaska Highway, Swift R., Clarke, *132*. MACKENZIE DISTRICT: Canol Road, mountain range west of head of Bolstead Creek, Mile 111 E., Wynne-Edwards, *8386-7;* Macmillan Pass, Porsild, *l.c.*; Brintnell L., according to Raup, *l.c.;* YUKON TERRITORY: Pelly Range, Porsild & Breitung, *9255, 9381, 9414, 9815. 9953, 10089, 10150, 10193* and *10585;* Haines Rd. near boundary, M.P. & R.T. Porsild, *233, 262* and *263;* Mayo, Ladue R., Bostock, *138;* Dawson Range, Carmaks, *idem, 31;* north fork of Klondike R. Cockfield, *68*.

General distribution: Alpine but not arctic: Kamtchatka and Eastern Chukotsk Peninsula, western and southern Alaska south to lat. 60° N., east through high mountains of central Alaska and Yukon to Mackenzie Mts. about latitude 63° N. and south to high mountains of northern British Columbia.

Type locality: "in insula Unalaschka" Chamisso.

Illustration: Hultén, Fl. Aleut. Isl., tab. 15 (1937).

13. **Antennaria neoalaskana** A.E. Porsild in Sargentia 4:71 (1943).

Caespitose, with a short, rather stout, freely branched, subligneous and rhizomatose base; the offsets sessile, their leaves spatulate 1-1.5 cm long, 0.2-0.3 cm wide, mucronate, thinly appressed tomentose on both surfaces and in age becoming glabrate. — Flowering stems 5-12 cm high, thinly floccose, stout, stiff and usually somewhat arching, bearing, from 4 to 7 linear-spatulate, scarious tipped leaves. — Inflorescence glomerulate, the lateral heads on 0.5 cm long peduncles; pistillate heads mostly 3; involucre circa 6 mm. high; phyllaries 2-seriate, long-attenuate, the outer somewhat lanate below, in youth with olive-green tips which in age become pale brown; pappus white; tips of corolla pale yellow; styles much exserted; achenes minutely papillose.—The staminate plant similar, but heads smaller, their phyllaries ovate-lanceolate, with obtuse, erose, pale stramineous tips, and clavellate pappus bristles.

Perhaps most closely related to *A. alaskana* which differs by its smaller heads and characteristic purplish leaf petioles. Superficially *A. neoalaskana* resembles *A. subcanescens* from which it differs by the shape and vesture of its leaves and by being dioecious.

Specimens seen: MACKENZIE DISTRICT: high alpine summits and slopes of Richardson Mts. west of Mackenzie Delta, Porsild *6727* (type), *6862* and *6864*. Alaska: Arctic Coast, Sadlerochit R., Spetzman, *1100* (S).

General distribution: Known only from the above mentioned stations.

14. **Antennaria pallida** E. Nels. in Proc. U. S. Nat. Mus. 23:700 (1901).
A. borealis Greene in Pitt. 4:85 (1899), not Gand.

Loosely tomentose, with well-developed stolons, their leaves spatulate-oblanceolate, 1.0 - 1.5 cm long, thinly but permanently

appressed woolly on both surfaces. — Flowering stems from 6 to 15 cm high with from 7 to 9 amply developed linear-lanceolate leaves lacking or almost without scarious appendages.—Inflorescence glomerulate, heads comparatively large, 3-5. Involucres 6-7 mm high; the outer phyllaries broadly and somewhat cuneately obovate obtuse, in youth conspicuously dark; the inner with attenuate, scarious, dirty white tips. Pappus bristles white. Achenes glabrous. Staminate plant unknown.

Antennaria pallida is a somewhat polymorphic species of the section *Alpinae* and, apparently, is limited essentially to the Pacific coast and to the Aleutian Islands. Perhaps most closely related to *A. isolepis* of the interior, from which it differs by its darker, non-spreading phyllaries, more ample stem leaves, lacking or almost without scarious appendages, and by its broadly spatulate basal leaves bearing a thin and appressed tomentum. In the Alaska Range and in mountains of northern British Columbia where *A. pallida* and *A. isolepis* meet, intermediate forms occur which may be referred to either species.

The specimens listed below, while not typical, are best referred to *A. pallida.*

Specimens seen: BRITISH COLUMBIA: Haines Road, near Yukon boundary, 59° 51' N. - 136° 58' W., M.P. & R.T. Porsild *231, 232* and *264;* Haines Rd., Klehini R., Clarke *421.*

Type locality: Disenchantment Bay (S.E. Alaska).

General distribution: Pacific Coast of Alaska from Juneau to the tip of Alaska Peninsula and Unalaska, north to mountains of northern British Columbia near the Yukon border; with a disjunct area in the central Aleutian Islands.

Illustration: Hultén, Fl. Aleut. Isl. tab. 15 (1937).

15. **Antennaria pedunculata** A. E. Porsild, n. sp.

Humifusa caulibus ramosissimis 5-8 cm longis stragulum 25-100 cm diametro formantibus. Stolones procumbentes 5-10 cm longi foliis oblanceolatis apice mucronatis, 2.0 cm longis 0.5 cm latis, juventute tomento tenui sericeo adpresso munitis, aetate glabrescentibus, costa unica distinctis. Caulis florifer 15-22 cm altus glabrescens, foliis 8-10 linearibus vel lanceolatis, imis obtusis, superioribus apicibus scariosis munitis. Calathia feminea 1-5 campanulata cymosa, inferiora sat remota, pedunculis 3.0 - 6.0 cm longis. Involucrum 0.7-1.0 cm altum basi lanatum. Bracteae triseriatae valde inaequales, exteriores oblanceolatae subfuscae, interiores oblanceolatae subacutae vel obtusae chartaceae, aetate nonnihil patentes. Corolla purpurea. Stylus valde exsertus bifidus. Achaenia 1.0 mm longa olivacea valde papillosa. Planta mascula ignota.

A rather peculiar looking species inhabiting open willow or birch thickets, rock slides and outwash plains. It is, undoubtedly, closely related to *A. stolonifera* from which it differs by its long-pedunculate lateral heads and by the broad, rather obtuse and pale chartaceous inner phyllaries. No intermediate forms were seen between it and *A. stolonifera.*

Specimens seen: YUKON TERRITORY: Pelly Range, Upper Rose River valley, Mile 95, elevation 3600 feet, on gravelly outwash plain, July 12, 1944, Porsild & Breitung, *10447* (type); alpine slopes of mountain east of Mile 77, *idem, 10965;* granite mountain opposite Mile 85-90, dry slopes, elevation 5000 feet, *idem, 10191.* ALASKA: Colville R., Umiat, Sept. 17, 1948, (overmature and fragmentay specimens), Polunin (S).

General distribution: Known only from above mentioned stations.

16. **Antennaria philonipha** A.E. Porsild in Rhod. **41**:294 (1939), tab. 554, figs. 1-10.

Plant dioecious, matted, forming small colonies by stolon-like offsets 5 to 10 cm long; basal leaves spatulate-obovate about 1.5 cm long and 0.4 cm wide, mucronate, glabrous above, appressed silky-tomentose beneath, becoming glabrate in age; stems very slender and weak, thinly floccose-tomentose, especially above, becoming glabrate in age, with 5 to 10 very reduced stem leaves tipped with very conspicuous brown, flat, obtuse and scarious 2.0 mm long appendages; stem of pistillate plant 10 to 14 cm tall, that of the staminate as a rule less than 10 cm high; heads solitary or very rarely 2 to 3 together, the staminate small, nodding when young, their involucres about 5.0 mm high with obovate, lead-coloured bracts and with pappus scarcely barbellate, slightly thickened at the apex; pistillate heads somewhat larger, their

involucres 6 to 7 mm high, the bracts of equal length, thin and hyaline, acuminate, dark brown below the tips, olivaceous when young, becoming pale straw-coloured in age; pappus rufidulous when mature, the rays merely scabrous, not at all plumose; style exserted, bilobed; achenes glabrous.

Antennaria philonipha is a very well marked species, perhaps nearest related to *A. monocephala* with which it, apparently, hybridizes when the two species meet. From *A. monocephala* it is at once distinguished by its tall and slender flowering stems and large pistillate heads, by its long, stolon-like offsets and by the much thinner indument of the leaves and stem. It is an arctic-alpine species which, as the name implies, is ecologically bound to moist, grassy places near alpine snow banks.

Specimens seen: MACKENZIE DISTRICT: Arctic Coast: six miles west of Kittigazuit, Porsild & Porsild, *2524* (type); Tuktuayaktoq, J. Robertson, *70;* Caribou Hills east of Mackenzie Delta, Porsild, *6553* and *16757;* east slope of Richardson Mts. west of Mackenzie Delta, *idem, 6861* and *6863.* YUKON TERRITORY: Pelly Range, Porsild & Breitung, *10154, 10524, 10964, 11013, 11050* and *11156;* Mayo District, Bostock, *137* and *230;* Mt. Sheldon, Porsild & Breitung, *11099, 11100, 11640, 11755, 11778* and *11779;* Macmillan Pass, *idem, 11273;* White Pass, Eastwood, *925;* Haines Road, near B. C. boundary, M.P. Porsild, *699* and *700.*

General distribution: Arctic-alpine: From Seward Peninsula east through high mountains of central Alaska and Yukon, east along the arctic coast of Mackenzie to Anderson R., south through Yukon to mountains of northern British Columbia.

Illustration: Porsild, *l.c.*

17. Antennaria stolonifera A. E. Porsild, n.sp.
? *A. media* Raup in Sargentia 6:244 (1947), not Greene.

Humifusa stolonibus bene evolutis, 5-10 cm longis, sublignosis repentibus et ample radicantibus, stragula diametri unius metre vel ultra formantibus. Folia basalia spathulata obtusa plane mucronata, 2.0-2.5 cm longa, 0.4-0.5 cm lata, utrimque tomento sericeo tenui adpresso induta, rarius glabrata, distincte uninervia. Caules floriferi per anthesim ca 10.0 cm alti, serius non parum elongati, fructiferi 14-18 cm alti, sat robusti rigidi erecti, sub tomento albo floccosa purpurascentes. Folia caulina 8-10, inferiora optime evoluta lineari-lanceolata, 1.5-2-0 cm longa apicibus scariosis destituta, superiora pauperrima apicibus longis scariosis. Calathia feminea 3-5 per anthesim dense aggregata, lateralia adulta, per elongationem pedunculorum, terminale superantia. Bracteae 3-seriatae, exteriores dense lanata apicibus obtusis griseis, interiores lineari-oblongae obtusiusculae olivaceae. Corollae purpureae stylis vix exsertis. Achaenia parva, 0.8 mm longa, papillis numerosis longis hispida. Pappus sordidus, minutissime barbellatus. Planta mascula ignota.

The large series of remarkably uniform material listed below suggests that *A. stolonifera* is a good and well marked species. It is a good match for some specimens in the National Herbarium of Canada from the Canadian Rockies, which by Greene were tentatively identified with his *A. media.* Our plant, however, is much taller than is true *A. media* of which the type, from Sierra Nevada, Cal., C. F. Sonne, July 31, 1892 (NY) is before me; also, in true *A. media* the staminate plant is common. Although hundreds of colonies of *A. stolonifera* were carefully examined, not a single male plant could be found. Our plant superficially resembles *A. atriceps* Fern. of mountains of northern British Columbia. That species, however, has glabrous achenes and long-acuminate, olivaceous phyllaries whereas in ours the phyllaries are obtuse and the achenes very hispid.

The type, No. *11377,* from a mountain on the upper Macmillan R. was collected late in the season near a perennial snowbank. The long series include specimens of all stages of development, and beautifully illustrate the range of seasonal development.

Specimens seen: YUKON TERRITORY: Canol Road, Pelly Range, Porsild & Breitung, *10151, 10231, 10232, 10448, 10586, 11051, 11052a* and *11155;* Mt. Sheldon, *idem, 11641* and *11780;* Itsi Range, *idem, 11392;* upper south fork of Macmillan River, shale mountain west of river, opposite Mile 268, forming dense mats near snowfield, elevation 5500 feet, *idem, 11377* (type); Macmillan Pass, Mackenzie-Yukon divide, *idem, 11272* and *11274.* MACKENZIE DISTRICT: Brintnell

Lake, Mackenzie Mountains, Raup, *9648* (n.v., recorded as *A. media* probably belongs here).

General distribution: Common on alpine slopes of S. E. Yukon east to Mackenzie Mts. (as *A. media),* south through the Canadian Rockies to Banff Pk.

18. Antennaria subcanescens Ostf. in Malte in Rhod. 36:112 (1934); Porsild in Sargentia 4:73 (1943).

A. alpina sensu Macoun & Holm in Rept. Can. Arct. Exp. 5:21A, tab. 12, fig. 3 (1921), not Gaertn.

Densely caespitose, forming flat cushions 10-15 cm in diameter, with short, ascending-erect, leafy offsets. Basal leaves oblanceolate, obscurely mucronulate, 1.5 - 2.5 cm long, including the well-developed petiole, and 0.4 - 0.5 cm wide, dark cinereous and thinly appressed tomentose on both surfaces.—Flowering stems 5 - 10 cm high, dark purplish, distinctly glandular-papillose under the sparse, appressed-woolly indument. Stem leaves 5 - 7, linear, thinly lanate, 1.0 - 1.2 cm long, the upper with 2 mm long, scarious appendages.—Inflorescence glomerulate; heads mostly 3. Involucres about 7 mm high; phyllaries slightly lanate and dark brown at the base, with long, narrow and greenish-brown tips; styles exserted, bifid; pappus bristles dirty white; achenes glabrous. Staminate plant unknown.

Antennaria subcanescens, like *A. compacta,* is densely caespitose but differs from that species by the very characteristic dark ashy-grey basal leaves, dark purplish flowering stems with long gland-tipped papillae beneath the thin, non-floccose indument.

Specimens seen: MACKENZIE DISTRICT: Arctic Coast, Bernard Harbour, Fr. Johansen, Can. Arct. Exp. No. *286a* (type); Cape Dalhousie, Porsild & Porsild, *2800;* Mackenzie Delta, north end of Richards Island, Porsild, *16855.* YUKON TERRITORY: Canol Road, Pelly Range, Porsild & Breitung, *11052.*

General distribution: Arctic-alpine: Mountains of Central Alaska and S. E. Yukon and the arctic coast of Mackenzie Distr. east to Coronation Gulf.

Illustration: Macoun & Holm, l.c. as *A. alpina.*

Sect. *DIOICAE*

19. Antennaria alborosea A. E. Porsild in M. P. Porsild in Can. Field-Nat. 60:85 (1946).

A. rupicola sensu Porsild in Sargentia 4:73 (1943), not Fern.

Stolons creeping, freely branching; the older subterranean and subligneous, the younger ones sarmentose, 5-10 cm long. — Basal leaves oblanceolate-cuneate, tapering into a narrow petiole, mucronate, 2.0 to 3.0 cm long, 0.5-0.6 cm wide, obscurely 3-nerved, glabrate or glabrous and deep green above, sericeous-appressed tomentose below.—Flowering stems 20 - 30 cm high, slender, stiff or sometimes arcuate, thinly arachnoid-tomentose, glabrate and greenish-purple. Stem leaves 15-20, linear-lanceolate, glabrate and fresh green, long acuminate but scarcely appendiculate, the lower 2.0 cm long, the upper much smaller. — Inflorescence lax cymose, nodding in youth, with from 5-8 pistillate heads on 0.6 - 1.0 cm long peduncles. Involucres 0.6-0.7 cm high, the phyllaries 3- to 4-seriate, conspicuously imbricated, thin and oblanceolate; the outer green with thinly lanate bases, the inner first beautifully roseate, later straw-coloured. Corolla with greenish tips. Style scarcely exserted. Achenes dusky brown, glabrous or minutely and sparingly papillose. Pappus silky and snowy white. Staminate plant unknown.

A very attractive species which inhabits sandy or gravelly and not too dry places on acidic soils in the lowland where it forms small colonies, sometimes one metre across. *A. alborosea* is probably closely related to *A. acuminata* Greene (from Chilliwack Valley, B.C.) from which it differs by its glabrous and fresh green upper leaf surfaces and by the more reduced stem leaves and larger heads; it is closely related also to *A. leuchippi* which, however, lacks the pink showy inner phyllaries and has permanently tomentose leaves.

In view of the more abundant material now available it is evident that the plant recorded from Bear Lake (Porsild, l.c.) as *A. rupicola* Fern. is actually *A. alborosea.* In *A. rupicola,* originally described from Maine (Rhod. 1:74 (1897)), and later reduced to a variety of *A. neodioica,* the bracts are said to have "conspicuous yellowish-white firm papery tips exceeding the dark bases". The 1928 collections from Bear Lake were overmature; better and younger series obtained in 1949 are a close match for the Yukon

plant. *A rupicola,* furthermore, is a limestone plant, whereas *A. alborosea* grew on neutral or acid soils.

Specimens seen: MACKENZIE DISTRICT: Bear Lake, McTavish Arm, Porsild & Porsild, *3640, 3648* and *3738A;* Etacho Pt., alpine meadows, *idem, 3517; ibid.,* Porsild, *17123.* BRITISH COLUMBIA: Bennett, near Yukon boundary, Malte, *63; ibid.,* Cowles, *935* (G, US). S. E. YUKON: Canol Road, Pelly Range, Porsild & Breitung, *9326, 10190* (type), *10325, 10446, 10633, 10868, 10966* and *11014;* Johnsons Crossing, M. P. Porsild, *316, 317, 436, 437, 499, 575, 576, 577, 578, 737* and *762;* Alaska Highway, Rancheria, Anderson, *10475,* in part.

General distribution: Alpine: Central Alaska through central and S. E. Yukon east to Bear Lake, south to mountains of S. E. Alaska and northern British Columbia.

20. **Antennaria Breitungii** A. E. Porsild, n.sp.

Humifusa, stolonibus sublignosis ramificatis repentibus bene evolutis, innovationes foliiferas ad 8 cm longas gerentibus. Folia basilaria anguste spathulato-obovata, 5-7 mm longa, 2-3 mm lata, juventute utrimque cinereo-tomentosa, sed aetate saepe superne glaberrima. Caules floriferi 8-12 cm alti, foliis 8-10 lineari-oblongis sine appendicibus scariosis instructis. Inflorescentia juventute nutans, calathiis 4-8 sat glomeratis. Involucra 5-6 mm alta phyllariis triseriatis roseis. Achaenia modice sed distincte papillosa. Planta mascula ignota.

Antennaria Breitungii differs from all other northern pink-flowered species by its short, somewhat crowded basal leaves that in age become perfectly glabrous above. In habit it resembles *A. nitida* but is at once distinguished from that species by its pink phyllaries and by the character of the tomentum. It grows on dry, sandy slopes of the lowland and flowers very early. It was named for August Breitung who for several seasons accompanied the writer in the field and contributed large numbers of beautifully prepared series of *Antennaria.*

Specimens seen: YUKON: Canol Road, Pelly Range, Porsild & Breitung, *9451* and *9493;* Whitehorse, sandy bluffs east of Lewes R., June 1-5, 1944, *idem, 9229* (type); *ibid.,* Anderson, *9596;* south end of Kluane Lake, *idem, 9513.* ALASKA: Anchorage, Lepage, O'Neill & Dutilly, *21089;* Anderson, *6529* (S).

General distribution: Southern dry belt of Yukon with a single station in Alaska.

21. **Antennaria crymophila** A. E. Porsild in Sargentia 4:69 (1943).

Plant densely caespitose or even pulvinate with numerous short, sessile and erect sterile rosettes. — Basal leaves spatulate, obtuse, about 1.0 cm long and 0.3 cm broad, persisting for several years, appressed white-tomentose on both sides, in age becoming dark grey. — Flowering stems ca. 10 cm high, covered by a floccose tomentum which in age peels off showing the dark-brown cortex. Stem leaves 6-8 rather distant, linear, the lower about 1.0 cm long, the upper much reduced and bearing long, scarious tips. — Inflorescence open, mostly with 4 heads; the lateral on 1-2 cm long peduncles. Involucres about 0.6 cm high; phyllaries 4- to 5-seriate, brownish black at the base, with obtuse, straw-coloured, papery tips. Pappus rufidulous; style barely exserted. Mature achenes olivaceous, minutely but distinctly papillose. — Staminate plant unknown.

Antennaria crymophila is perhaps most closely related to *A. pulvinata* Greene of moutains of Alberta and British Columbia but differs from it in the open inflorescence, taller flowering stem and strongly developed, thick stolon.

Specimens seen: MACKENZIE DISTRICT: dry, gravelly places along the East Branch of the Mackenzie Delta, Porsild, *7053* (type).

General distribution: Known only from the type locality.

22. **Antennaria elegans** A. E. Porsild, n.sp.

Humifusa, stolonibus sublignosis ramificatis repentibus bene evolutis, stragula parva et laxa formantibus. Folia divaricata lineari-oblanceolata apice acutiuscula, 10-20 mm longa, 2-3 mm lata utrimque tenue adpresso-sericea. Caulis florifer 12-18 cm altus gracilis et parum floccosus, foliis plerumque 10 utrimque adpresso-tomentosis, linearilanceolatis 10 mm longis, 2 mm latis, inferioribus obtusiusculis, superioribus duobus (vel unico) apice scarioso tenui munitis. Calathia feminea (1) -4-(8) per anthesim laxe aggregata, lateralia adulta, per elongationem pedunculorum, terminale superantia.

Involucrum 5-6 mm altum, bracteis angustis 3-vel 4-seriatis, initio valde imbricatis deinde patentibus. Bracteae exteriores ovatae basi fuscae parce lanatae apice straminescentes, interiores oblongo-lanceolatae acuminatae erosae, initio venuste roseae, deinde straminescentes. Corolla apice viridescens. Stylus vix exsertus. Achaenia fusca, laevissima. Planta mascula ignota.

Antennaria elegans is a rather attractive species well marked by its matted growth, narrow, appressed-sericeous-tomentose and spreading leaves, its slender up to 20 cm tall, and somewhat flexuous stems and by its numerous and rather ample, oblanceolate, obtuse stem leaves of which all but the topmost lack scarious appendages. In life the young inner phyllaries are pale rose but soon turn grey or straw-coloured.

This species which appears to be common in S. E. Yukon, was collected by the writer on Bear Lake, N.W.T., in 1928, but was erroneously reported by him in Sargentia 4:71 (1943) as *A. isolepis* (Porsild & Porsild, *3440, 3516* and *5085*).

Specimens seen: NORTHWEST TERRITORIES: Great Bear Lake, Etacho Pt., 1500' elev. Porsild & Porsild, *3516, ibid.* Porsild, 17124; north shore of Smith Arm. Porsild & Porsild, *5085;* Keith Arm, Russell B., *idem, 3440.* YUKON: Canol Road, Pelly Range, Porsild & Breitung, *10189, 10414, 10523, 10865, 10967, 11015* including: upper Rose R., dry gravel benches, *10411* (type); Mt. Sheldon, *idem, 11639* and *11644.*

General distribution: Alpine: Mountains of S. E. Yukon and Great Bear Lake.

23. **Antennaria incarnata** A. E. Porsild, n.sp.

Humifusa, stolones suffrutescens ramosissimum, 3-5 cm longi suberecti, foliis confertis oblanceolatis vel spathulatis apice acutis mucronibus tomento occultis, 1.0 cm longis, 0.3 cm latis utrimque tomento incanosericeo vestitis. Caulis florifer 10-12 cm altus adpresse sericeo-tomentosus, foliis 7-8 linearibus, 1.0 - 1.5 cm longis, 0.2 cm latis, acutis vel attenuatis apice vix scariosis. Calathia feminea 5-8 cymam subglobosam formantes, pedunculis eglandulosis inferioribus interdum ramificatis. Involucrum 5 mm altum, bracteis bi- vel triseriatis sub-aequalibus: exteriores basi virides dense lanatae, apicibus roseis, interiores oblongo-lanceolatae pallide incarnatae, in vivo purpureo-puncticulatae. Corolla apice pallide purpurascens. Stylus exsertus. Achaenia laevia. Planta mascula ignota.

A rather attractive and distinct little species which forms small, but rather dense colonies in turfy places on river terraces, outwash plains and in open birch thickets. By its small size alone it is easily distinguished from *A. alborosea,* and from the rather polymorphous *A. rosea* by its more numerous and smaller heads. It rather closely resembles *A. Hansii* (*A. groenlandica)* of S. W. Greenland from which it differs by its always pink phyllaries lacking the dark spot at the base of the outer row. A single collection from Bear Lake was erroneously reported as *A. isolepis,* Porsild in Sargentia 4:71 (1943).

Specimens seen: MACKENZIE DISTRICT: Great Bear Lake, McTavish B., Porsild & Porsild, *5211.* S. E. YUKON: Canol Road, Pelly Range, turfy river terraces of upper Rose R. near Mile 95, elevation 3600 feet, July 11, 1944, Porsild & Breitung, *10412* (type) and *10445.*

General distribution: Great Bear Lake, S. E. Yukon.

24. **Antennaria isolepis** Greene in Ottawa Nat. 25:41 (1911); Porsild in Sargentia 4:71 (1943) pro max. pte.; *idem,* in Nat. Mus. Can. Bull. **101**:27, 32 (1945); Raup in Sargentia 6:243 (1947).

Humifuse, with leafy stolons up to 5 cm long. Basal leaves oblanceolate, 1.5-2-0 cm long and 3-4 mm broad, subacute or short mucronate, appressed white-tomentose on both surfaces but more densely so underneath. — Flowering stems 10-15 cm high, somewhat flexuous, floccose-tomentose; cauline leaves numbering about 10, linear-oblanceolate, floccose-tomentose, the lower about 1.5 cm long, with subulate tips, the upper not much reduced, with broad, flat, scarious tips; heads 3-6, usually 4, the lateral on 1 cm long penduncles; involucres 6-7 mm high; phyllaries 3-seriate, oblanceolate, with oblong, erose, papery white and spreading tips; pappus bristles white; achenes glabrous. — Staminate plant unknown.

Antennaria isolepis in Alaska may sometimes resemble over-mature specimens of

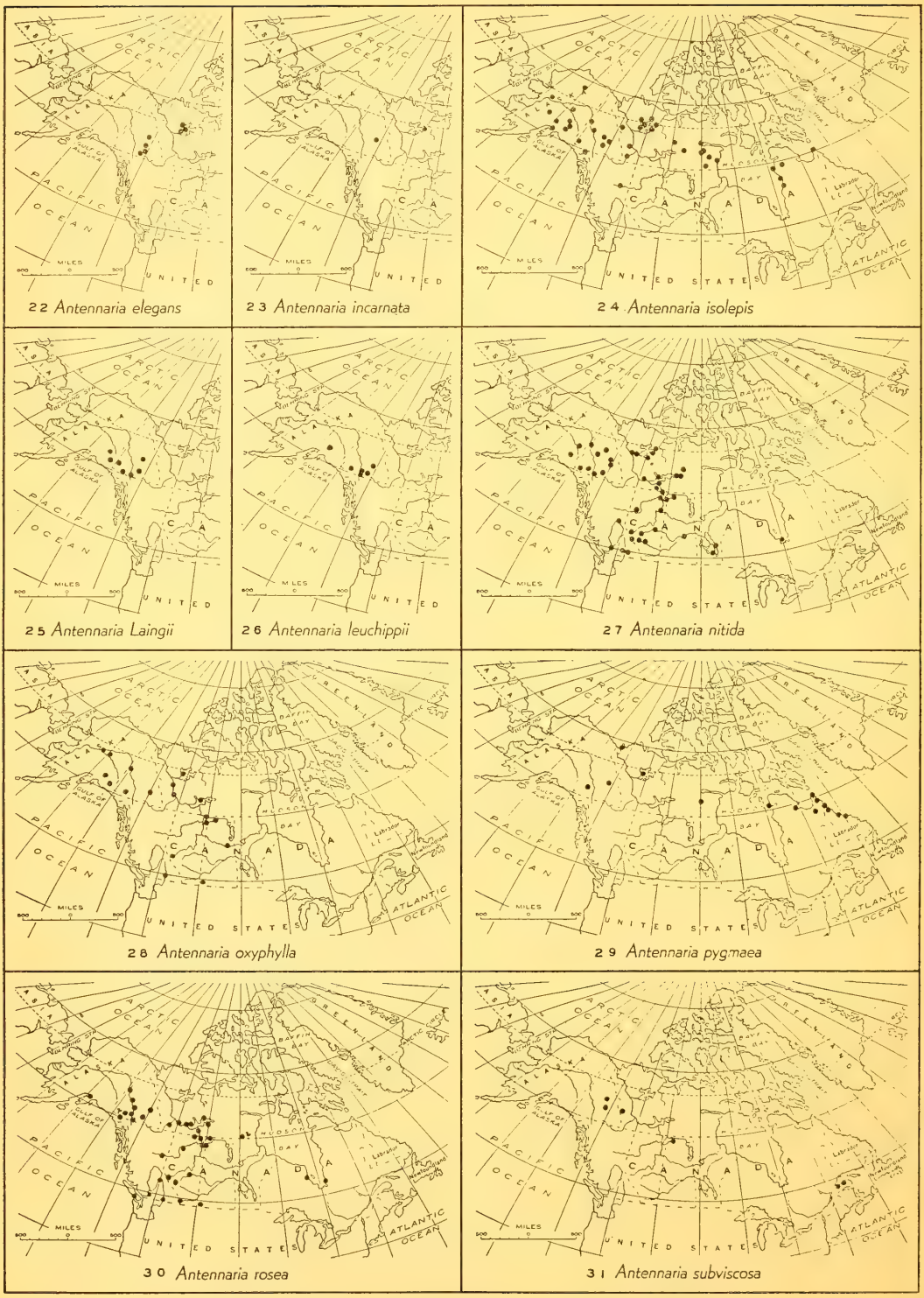

Plate 3. Distribution of **Antennaria** in Northwestern Canada.

A. pallida from which it may always be distinguished by its more ample stem leaves with strongly developed scarious tips.

Fernald's statement in Rhodora 26:102 (1924), that the achenes of *A. isolepis* are "sparingly papillose" and the flowering stems "0.7-2.5 dm high", probably refer to specimens of the taller *A. Rousseaui* Porsild, in Can. Field-Nat. 63:80, tab. 1, figs 1-5 (1949), from northern Ungava. At any rate, the type as well as all other specimens of *A. isolepis* seen by the writer from west of Hudson Bay have glabrous achenes. Greene's statement, *l.c.*, "I suspect that the plant here described is male" is difficult to understand, for the type, J. M. Macoun, Can. *79270,* consists of three plants with a total of nine normal and well developed pistillate inflorescences with fully expanded flowers and almost mature achenes.

Specimens seen: MACKENZIE DISTRICT: Great Bear Lake, Porsild & Porsild, *4969* and *3558;* Hanbury R., 63° 40' N.-105°W., Radford, Can. *132365;* Lone Mt., near confluence of N. Nahanni and Mackenzie R., Wynne-Edwards, *8519;* Mackenzie Mts., Canol Rd. Mile 111 east, *idem, 8384a.* YUKON: Canol Road, Pelly Range, Porsild & Breitung, *10092, 10094a, 10152, 10194, 10324;* Kluane Lake, Anderson, *9477* (in part); Dawson, Eastwood, *236.*

Type locality: Keewatin, Cape Eskimo [Eskimo Pt.], Lat. 61°05'N.

Illustration: Fernald, l.c., tab. 142, fig. 7.

General distribution: Mountains of central Alaska and Yukon, south to mountains of northern British Columbia, east through Bear Lake and Keewatin to the west coast of Ungava and northern Labrador coast.

25. **Antennaria Laingii** A. E. Porsild in Rhod. 41:293 (1939), tab. 554, figs. 11-13.

Caespitose, matted, with long, stolon-like offsets; leaves of the rosettes numerous, 1.0 to 1.5 cm long, about 0.3 cm wide, oblanceolate-spatulate, acuminate, densely canescent-tomentose on both sides; stems rather stout and rigid, woolly above, canescent below, 8 to 14 cm high, leafy with 10 to 14 well developed, flat, linear-spatulate leaves, these canescent with a dense even felt, acuminate or mucronate, but not at all scarious-tipped; pistillate heads 3 to 8 in dense glomerules; outer phyllaries green, with scarious brown tips, like the peduncles densely white-woolly; inner phyllaries lanceolate, obtuse, papery, ivory white; pappus white; achenes glabrous; staminate plant unknown.

Antennaria Laingii, in S. E. Yukon, is invariably found on dry, shaly or sandy foothills of Palaezoic rocks; its closest relative may be *A. nitida* from which it differs by its stout rhizomatose stolons, its dull and densely canescent-tomentose, not at all silky or spreading basal leaves and by its stiff and rather stout flowering stems with well developed leaves entirely lacking brown, scarious tips. As in *A. nitida* the young flowering heads are nodding.

Specimens seen: YUKON: Canol Road, Pelly Range, Lapie Crossing, Porsild & Breitung, *9753;* Alaska Highway between Whitehorse and Johnsons Crossing, *idem, 11162;* Whitehorse, *idem, 9228* and *9231;* south end of Kluane Lake, Anderson, *9477* (in part); Alaska Highway, Rancheria, Anderson, *10476* (S).

Type locality: Head of Chitina R., Alaska.

General distribution: dry interior of central Alaska and southern Yukon; Rocky Mts.?.

Illustration: Porsild, *l.c.*

26. **Antennaria leuchippi** M. P. Porsild in Can. Field-Nat. 60:85 (1946).

Humifuse, with up to 9 cm long, leafy stolons. Basal leaves about 2.0-2.5 cm long, 0.4 cm wide, oblanceolate-spatulate, mucronate, densely white tomentose on both sides. —Flowering stems erect, greenish-purple under the thin, floccose tomentum, 25-30 cm high, with about 15 evenly spaced and well developed stem leaves, the lower as long or longer than the basal leaves, the upper gradually decreasing in size, all conspicuously mucronate and the upper with brown, scarious tips. — Inflorescence cymose, usually with from 6-10 glomerulate, short-pedicellate heads but frequently also with lateral, long-pedunculate heads rising from the axis of the uppermost stem leaves. Mature involucres turbinate, 5-6 mm high, tomentose below; phyllaries 4-seriate, subobtuse or the inner subacuminate with entire, scarious

white tips which in youth are dotted with tiny pink spots. Corolla purple, 3.0 - 3.3 mm long, its lobes short pilose. Style not exserted. Achenes small for the size of the plant, about 1.0 mm long and 0.3 mm broad, glabrous. Staminate plant unknown.

A rather striking and attractive species which forms small colonies up to one metre in diameter on gravelly or sandy river banks. It is, perhaps, most closely related to *A. alborosea* from which it differs by the permanent indument of the upper surface of the leaves, by its smaller cauline leaves, by its smaller heads and papery white or at most pink-dotted inner phyllaries.

Specimens seen: YUKON: Canol Road, Pelly Range, Porsild & Breitung, *10415, 10526* and *10866b;* Johnsons Crossing, M. P. Porsild, *542, 543, 544, 603, 639, 739, 740* and *741;* Whitehorse, July 11, 1944, A. & R.T. Porsild (type); Takhini R. w. of Whitehorse, Michel *35* in part (Calif.). ALASKA: Alaska Range, Glenn Highway, Anderson, *10771* (S).

General distribution: Thus far known only from S. E. Yukon and Central Alaska.

27. **Antennaria nitida** Greene in Pitt. 3:283 (1898); Raup in Journ. Arn. Arb. **17**:305 (1936); Porsild in Sargentia 4:71 (1943); *idem* in Bull. Nat. Mus. Can. **101**:33 (1945); Raup in Sargentia 6:244 (1947).—See Fernald in Rhod. 26:101 (1924).

Humifuse and densely matted with well developed, subligneous, freely branching and leafy stolons. Basal leaves small and spreading, obovate - oblanceolate, mucronate, narrowly petiolate, 0.5 - 1.5 cm long, 0.4 - 0.5 cm wide, somewhat involute and almost keeled from the prominent median nerve, silvery white and almost shiny on both surfaces due to the finely appressed tomentum.—Flowering stems of the pistillate plant from 5-25 cm high, slender and somewhat flexuous, pale green and thinly arachnoid-tomentose, bearing from 8-20 linear leaves, the lowermost merely mucronate, the upper with attenuate brownish and scarious tips. — Inflorescence cymose, densely glomerulate and nodding in youth, in age open and branched, the lower branches often distant and bearing up to 4 heads. Involucres 6-7 mm high, viscid-hirsute; phyllaries in 4 rows, pale green below with oblong, obtuse and entire, papery white tips. Pappus white, scarcely exceeding the mature corollas; styles barely exserted; achenes glabrous. — Staminate plant similar in stature but with broader and often reflexed tips of the phyllaries and with conspicuously barbellate pappus bristles.

Antennaria nitida is a common and widespread species on calcareous soils of the lowland and in the Northwest is one of the earliest flowering species in the genus; the young flowering heads are nodding but towards maturity the stems elongate and become erect. Although a somewhat polymorphous species which shows considerable variation in stature according to the habitat and latitude, *A. nitida* may always be recognized by its short, broad, obovate and silvery basal leaves and by its diffuse growth habit. In the southern part of its range the staminate plant is as common as is the pistillate one but towards its northern limit appears to be decidedly less common or even totally lacking.

Specimens seen: MACKENZIE DISTRICT: Lockhart River, E. end of Slave Lake, Tyrrell, Can. *23176;* McTavish Arm, Bear Lake, Porsild & Porsild, *3649, 3660, 3686* and *3739;* Mackenzie River, 10 miles below Mills Lake, Wynne-Edwards, *8560;* Bear Rock, Porsild & Porsild, *3398;* Nyarling R., Russel, Can. *105283.* YUKON: Canol Road, Pelly Range, Porsild & Breitung, *9325, 9369, 9452, 9453, 9492, 9495, 9752, 9754, 9814, 10866a, 10093, 10095, 10149, 10326;* Johnsons Crossing, M. P. Porsild, *318, 431, 433, 434, 481, 542, 735;* Whitehorse, Anderson, *9596* (S), *1942,* (NY); ibid. M. P. Porsild, *111; ibid.,* Macoun, *79019; ibid.* Porsild & Breitung, *10704;* Keno, Mayo District, Anderson, *9800;* Haines Road, M. P. Porsild, *145;* Bear Creek, August 6, 1920, A. Müller (Can, G); Kluane Lake, Anderson, *9513* (S); Dawson District, Bonanza R., Eastwood, *445;* Dawson, Macoun, *79021* (Can, NY), *ibid.,* Eastwood *236* (G).

Type locality: Charlton Island, James Bay.

General distribution: Prairies and plains. From Central Alaska through upper Yukon and Mackenzie District north to Bear Lake, east to James Bay, south to Manitoba, Alberta and interior British Columbia, and in the Rocky Mountains south to New Mexico.

Illustration: Fernald in Rhodora **26**, tab. *142, fig. 9. (1924).*

28. **Antennaria oxyphylla** Greene in Pitt. 4:284 (1901); Raup in Journ. Arn. Arb. 17:305 (1936); *idem* in Sargentia 6:244 (1947).

Humifuse, with short, leafy ascending-erect stolons, forming small, rather compact colonies. — Basal leaves 1.5 - 2.0 cm long and 0.6 - 0.7 cm broad, obovate-oblanceolate, distinctly mucronate, with one prominent median and weaker lateral nerves on the underside, silvery gray, appressed tomentose on both surfaces but more densely so on the underside. — Flowering stems 20 - 25 cm high, slender and somewhat arched, the cortex greenish to purplish brown under the thin, caducuous, floccose tomentum; stem leaves about 9 or 10 evenly spaced, linear-lanceolate, the lower about 1.5 cm long and 0.3 cm wide, merely acuminate, the upper rapidly diminishing in size and terminating in thin, scarious tips.—Inflorescence glomerulate, with from 3 - 5 heads; involucres 6 - 7 mm high, lanate below; phyllaries 4-seriate, the outer ones pale reddish-green, the inner pale pink in youth, soon turning straw-coloured, with oblong, attenuate somewhat erose, non-spreading tips. Pappus bristles white, much longer than the reddish-purple corollas; styles barely exserted; achenes 1.4 mm long, glabrous. — Staminate plant not known.

Our plant differs from that of the Rocky Mountains chiefly in the slightly smaller and less numerous heads and by the phyllaries which in youth are pale pink whereas those of the Rocky Mountain plant are said to be white. *A. oxyphylla* differs strikingly from all other northern pink-flowered species of *Antennaria* by its short, ascending stolons bearing 2 cm long obovate, silvery gray leaves, 15-25 cm tall flowering stems and rather small heads.

Specimens seen: MACKENZIE DISTRICT: Bear Lake, Etacho Pt., elev. 2000', Porsild, *17124a;* Mackenzie River near Wrigley, Porsild, *16675;* north shore of Slave Lake, Howe, Can. *91995.* YUKON: Canol Road, Pelly Crossing, Porsild & Breitung, *9860;* Alaska Highway, Rancheria west of Whitehorse, Anderson, *10475* in part (S); Dawson District, 50-Mile R., June 28, 1899, Bolton (US).

Type locality: Spanish Basin, Gallatin Co., Montana.

General distribution: Prairies and dry meadows: Central Alaska and Yukon east to northern Saskatchewan and south through the Rocky Mountains to Nebraska and S. Dakota.

29. **Antennaria pygmaea** Fern. in Rhod. 16:129 (1914); ibid. 26:99, tab. 142, figs. 5 & 5a (1924); Porsild in Sargentia 4:72 (1943).

Humifuse, with very short erect-ascending stolons, forming small, compact tufts.—Basal leaves oblanceolate, prominently mucronate, 0.8 - 1.4 cm long, 0.3 - 0.4 cm broad, glabrous or glabrate above, thinly appressed tomentose beneath.—Flowering stems from 4 - 14 cm high, stiff, dark purplish brown and finely papillose under the thin arachnoid indument, bearing about 9 somewhat crowded linear-oblanceolate, 6 -14 mm long, glabrate leaves, all bearing prominent up to 4 mm long narrowly deltoid to subulate, scarious brown tips. — Heads large, solitary or occasionally two side by side or even two smaller lateral heads below the terminal one; involucre hemispherical, about 7 mm high, lanate at the base; phyllaries densely imbricated, in 3 or 4 rows, oblong and obtuse; the outer fuscous with short stramineous tips; the inner with long obtuse stramineous tips. Pappus bristles silky, white, longer than the corollas; styles barely exserted; achenes glabrous. — Staminate plant not known.

As with *A. angustata, A. isolepis* and several other "eastern" species, the known range of *A. pygmaea* has recently been extended west through Keewatin and Mackenzie districts to Yukon. Superficially *A. pygmaea* resembles the pistillate plant of *A. monocephala* from which it may at once be distinguished by its larger heads and pale, straw-coloured inner phyllaries.

Specimens seen: MACKENZIE DISTRICT: Bear Lake, Etacho Pt., elev. 1500', Porsild & Porsild, *3515;* Mackenzie Delta, north end of Richards Island, Porsild *16854; ibid,* Porsild & Porsild, *2286-7.* YUKON: Canol Road, Pelly Range, Porsild & Breitung, *10584.*

Type locality: "Okkak, Labrador".

General distribution: arctic-alpine: Northern Ungava, Labrador and Hudson Bay,

west through Keewatin and Bear Lake to the Mackenzie Delta, south to mountains of S. E. Yukon.

Illustration: Fernald, *l.c.*

30. **Antennaria rosea** (Eaton) Greene in Pitt. 3:281 (1898); Raup in Journ. Arn. Arb. 17:304 (1936); Porsild in Nat. Mus. Can. Bull. **101**:33 (1945); Raup in Sargentia 6:244 (1947).

A. parvifolia Britt. & Rydb. in Bull, N.Y. Bot. Gard. 2:185 (1901), at least in part.

A. plantaginifolia Macoun in Ann. Rept. Geol. Surv. Can., 1887-8, 3, 1:221B (1889).

Humifuse, with strongly developed, long, ligneous and freely branching stolons each branch ending in an erect or ascending leafy rosette which the following year produces a flowering stem; adventitious roots appearing on the subterranean part of the branches in the third year. — Basal leaves oblanceolate, acute, about 2.0 cm long and 0.4 cm wide, often involute in age, with a densely appressed pale yellowish-green tomentum; the old leaves persist for several seasons. — Flowering stems rather weak, in our area usually 10 - 15 cm high, but farther south frequently twice as high, with 8 - 10 linear, 2.0 cm long, acuminate leaves all without scarious appendages. The inflorescence rather compact with 3 - 5 rather small heads in a hemispherical cyme. Involucres 4 - 5 mm high; phyllaries of unequal length, 3 - seriate, the outer ones pale green and lanate, the inner lanceolate, acuminate dark rose or pink, fading in age. Pappus dirty white, not lustrous; styles not exserted, and the achenes glabrous. — The staminate plant unknown.

The name *A. rosea* is applied only provisionally to the series of plants listed below, and not until a comprehensible revision has been undertaken of the pink-flowered species inhabiting the Rocky Mountains, can it be determined what species, if any, should rightly bear that name.

Specimens seen: MACKENZIE DISTRICT: Fort Smith, E. Taylor, *39* and *118;* Slave Lake, Rocher R., Harper, Can. *105532;* Slave Lake, R. Bell, Can. *105530;* Mackenzie R., above Providence, Porsild, *16578;* 10 miles above Mills Lake, Wynne-Edwards, *8561;* lower Mackenzie (without locality) Stringer, Can. *105531;* Liard R., between Nahanni Butte and Simpson, Crickmay, *111.* YUKON: Canol Road, Pelly Range, Porsild & Breitung, *10323, 10327, 10525, 10866;* Teslin Lake, M. P. Porsild, *571, 573, 633, 636, 738;* Bennett, Macoun, *79018* (NY); Whitehorse, Porsild & Breitung, *10705;* Lewes R., Sept. 6, 1887, Dawson, Can. *11286;* Alaska Highway Mile 970, Anderson & Brown, *10012* (S); Five Finger Rapids, Tarleton, *93* (NY, US); Ft. Selkirk, Gorman, *1164* (US); Ranch Creek, Gorman, *1062* (Can, US); Haines Road, July 1909, E. W. Scheuber (US); *ibid.*, Clarke, *353;* Dawson District, Hunter Creek, Macoun, *79020;* Moosehide, *idem, 79022.*

Type locality: Rocky Mountains.

General distribution: Pacific coast of Alaska south to California east through southern Yukon and Mackenzie to James Bay.

Illustration: Henshaw: Mountain Wild Flowers of Canada, tab. 47 (1906), as *A. parvifolia* var. *rosea.*

31. **Antennaria subviscosa** Fern. in Rhod. 16:131 (1914), and 47:232 (1945) tab. 916 & 917; Raup in Sargentia 6:244 (1947).

Humifuse, with freely branching, subligneous stolons ending in leafy, erect or ascending rosettes. — Basal leaves oblanceolate-spatulate, obtuse and scarcely if at all mucronate, 1.0 - 1.5 cm. long and 3 - 5 mm broad, densely white-tomentose on both surfaces. — Flowering stems 8 - 11 cm high, floccose, slender and more or less flexuous, with about 10 linear-oblanceolate leaves, the lower about 1.0 cm long, merely acuminate, the upper but slightly reduced in size, with thin, subulate brown and scarious tips.—Inflorescence glomerulate, hemispherical, with from 3 - 6 heads; involucre 5 - 6 mm high, densely white-lanate below; phyllaries 3-seriate; the outer ones green below, with a brownish centre and stramineous blunt, papery tips; the inner with paler and more attenuate tips. Pappus white; styles barely exserted; achenes glabrous.—Staminate plant unknown.

Our plant differs from typical *A. subviscosa* (otherwise endemic to the Gaspé Peninsula, Que.) by having the achenes perfectly glabrous and by the lack of viscid glands at the base of the involucres and on the uppermost part of the stem; otherwise it is a close match for the Gaspé plant. It is probably closely related to *A. albescens* (Nels.) Rydb. of the Rocky Mountains of which the writer has seen no authentic material. Rydberg, however, places that species in the section *Alpinae*.

Specimens seen: S. E. YUKON: Canol Road, Pelly Range, Porsild & Breitung, *9973, 10090, 10094, 10634*. MACKENZIE DISTRICT: Brintnell Lake, (according to Raup, *l.c.*). SASKATCHEWAN: Athabaska Lake, Cornwall B., Raup, *6452* (distributed as *A. nitida*).

Type locality: Gaspé, Que.

General distribution: Gaspé, Que., Athabaska Lake and mountains of S. E. Yukon.

Illustrations: Fernald, *l.c.*

SPHAERIIDAE OF ATHABASKA AND GREAT SLAVE LAKES, NORTHWESTERN CANADA [1]

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EXTENSIVE COLLECTIONS of sphaeriids from Athabaska and Great Slave Lake were made during the years 1944-46, in the course of fisheries investigations under the direction of Dr. D. S. Rawson of the Fisheries Research Board of Canada. In view of the scarcity of information concerning the Sphaeriidae of northwest Canada, the writer was glad to receive these specimens for examination.

Lake Athabaska, lying across the northern part of the border between the Provinces of Saskatchewan and Alberta, is between 58° and 60° north latitude and 107° and 112° west longitude. Great Slave Lake is between 61° and 63° north latitude and 109° and 117° west longitude and is within the North West Territories.

It may be that the great size of these northern lakes — Athabaska, Great Slave and Great Bear — is not generally appreciated. Many people assume that the five Great Lakes are the largest on the continent. Athabaska and Great Slave Lake, along with Great Bear the fourth largest lake in North America, are the main bodies of water of the Mackenzie River System whose outlet is the Arctic Ocean. About one-fifth of the area of Canada is drained by the Mackenzie River System. Lake Athabaska has an area of about 3,050 square miles. Into this lake flows Athabaska River. As the water leaves the lake it is known as Slave River. It is joined at once by the Peace River. The Slave River enters Great Slave Lake at about the middle of the south side of the lake. Great Slave Lake, the fifth largest lake in North America, has an area of about 10,500 square miles. (Lake Ontario has an area of about 7,240 square miles). The Mackenzie River begins where the water leaves the western end of Great Slave Lake.

Both Athabaska and Great Slave Lake (as is also the case with Great Bear Lake) lie across the western edge of the Precambrian Shield. The western ends of these lakes are in the more recent formations and are shallower and the water warmer than in the eastern ends where the shores are more rugged and the water deeper. In Lake Athabaska the maximum depth is 405 feet. A depth of 2,000 feet was found in Christie Bay, Great Slave Lake. This is one of the deepest spots in North America — even deeper than Lake Superior.

The collections included representatives of 19 species which are discussed in the following list. Data are included as to distribution, both in depth and area.

The specimens were obtained mostly by means of an Ekman-Birge dredge which brought up 1/20 of a square metre — approximately 80 square inches.

1 Received for publication December 15, 1948.

The writer wishes to make grateful acknowledgement to Dr. J. G. Oughton for continued help and encouragement in the systematic study of the Sphaeriidae and to Dr. D. S. Rawson for materials and assistance in the preparation of this report.

The quotations in this paper are from the "Fisheries Research Board of Canada, Bulletin No. LXXII, North West Canadian Fisheries Surveys in 1944-1945."

GREAT SLAVE LAKE

There were 173 dredgings which contained specimens of sphaeriids.

Pisidium conventus Clessin. One hundred and thirty-six dredgings brought up *P. conventus*. Of these there were 2285 specimens — including empty shells but not single valves. These were secured in various parts of the lake. The greatest number of shells in a single dredging was 241, in water less than two metres in depth. Eight hundred and sixty-six specimens (38%) were dredged from a depth of less than 5 metres. From a depth of 12 metres and on there were 14 dredgings containing 20 or more shells coming up at intervals up to 44 metres, the latter having 22 shells. After 44 metres the live specimens were more intermittent until 77 metres was reached, then one specimen was brought up in the 101-121 metre zone, one at 137 metres, and one at 140 metres. On July 2, 1947, an adult was secured in Hearne channel at a depth of 219 metres.

Pisidium subtruncatum Malm. The 1119 specimens of *P. subtruncatum* were brought up from various parts of the lake in 73 dredgings. That is less than half as many specimens as in the case of *P. conventus* and in a little more than half as many places. The greatest number of shells to a single dredging was 133, in water less than two metres in depth. Eight hundred and ninety-four specimens (80%) were brought up from less than 5 metres. Below 7 metres the number fell off, there being only one dredging containing over 20 specimens — 25 specimens at 12 metres. Dredging continued to bring up live specimens, in small numbers, regularly until 20 metres was reached. After that only two lots were recovered — 1 specimen at 57 metres, and 5 at 79 metres.

In some species of pisidia there are one or more forms that so closely resemble some other species that identification of the specimens is exceedingly difficult. This close approach of species occurs in some of the specimens from Athabaska and Great Slave Lake. These specimens stand at the meeting point of *P. henslowanum* (Sheppard) variety *distans* Stelfox, *P. subtruncatum* Malm and *P. lilljeborgi* Clessin. In this instance I have followed Dr. Jules Favre, Geneva, Switzerland, who examined some of the specimens, in calling them *subtruncatum*. It is quite possible that I have included a few specimens that are really *lilljeborgi* — no undoubted *henslowanum* were found in either lake.

The only other pisidia in Great Slave Lake that have any claim to being deep-water forms are *idahoense* and *lilljeborgi*.

Pisidium idahoense Roper. There were 21 dredgings containing *idahoense*, but only 43 specimens in all. These were from the North Arm and central part of the lake. The largest number found in any one dredging was 7, at 1 metre. But live specimens continued to be found in ones and twos right down to 24 metres.

Pisidium lilljeborgi Clessin. *P. lilljeborgi* (equals *P. scutellatum* Sterki) was taken in 13 dredgings — 52 specimens — but the largest number of specimens to a dredging was 9, at 11 metres. They began at 3 metres and ended with a single live adult in the 15 to 25 metres zone at Yellowknife. They were found almost entirely in the Yellowknife region and in the western half of the lake — one specimen only coming from the eastern end, at Reliance.

Pisidium medianum Sterki. Six lots of a form of this species were found, a few in dredging, in water from one to four metres. None were from the eastern end of the lake. These may be *P. hibernicum* Westerlund.

Pisidium pauperculum Sterki. There were two lots of *pauperculum* — 10 specimens — from Preble Island near the south-centre of the lake, and in water of 2 and 5 metres depth.

Pisidium compressum Prime. Only one lot of 10 specimens from one metre, at the west end of the lake.

Pisidium punctatum Sterki. One valve in Yellowknife Bay, north arm.

Pisidium fallax Sterki. A few empty shells, toward the west end.

Pisidium lermondi Sterki. Three specimens found in a pond on Caribou Island.

Pisidium milium Held. Two specimens in the same pond as above.

Pisidium lermondi, splendidulum and *tenuissimum* so strongly resemble forms of *P. nitidum* Jenyns of Europe that they may prove to be conspecific.

Sphaerium striatinum Lamarck. Of these but four lots were found — 12 specimens — in water of 2-3 metres. Some of these shells are higher than the usual run of *striatinum* and may be a related species.

Sphaerium tenue nitidum Clessin (equals *S. tenue walkeri* Sterki). This species was quite plentiful and from different parts of the lake — 175 specimens — but specimens in quantity were only found in the north arm. They were brought up in 35 dredgings, five of which were at one metre. At Yellowknife one dredging, between 3 and 6 metres, brought up 50 specimens, another in the 14 to 25 metre zone had 27 specimens.

Musculium transversum Say. A small form and only 3 specimens — 1 dredging at 1 metre — at Yellowknife Bay, north arm.

Musculium winkleyi Sterki. What appears to be this species was found at one and 5 metres — 7 specimens — at the south-center of the lake and at Yellowknife Bay.

Musculium ryckholti Normand. Two dredgings brought up four live specimens and four valves at 1 metre and a single worn specimen at 22 metres. Both dredgings were at Outspost Island, center of lake. But Dr. John G. Oughton, one of the expedition, picked up specimens, as shore debris, at Yellowknife Bay as well as at Outpost Island. At the latter place he also collected live specimens in a pond.

LAKE ATHABASKA.

There were 100 dredgings which contained specimens of Sphaeriidae.

Pisidium subtruncatum Malm. Fifty-six dredgings brought up *P. subtruncatum,* from different parts of the lake. The total number of specimens of this species was 534. The greatest number to a dredging was 76. Four hundred and twenty-two specimens (79%) came from a depth of less than 5 metres. The greatest number of specimens from a dredging of 11 metres or over was 11. From beyond 12 metres only 18 specimens were secured. These were from 9 dredgings, and five of these came from the deepest dredging bringing up *subtruncatum* in this lake — 36 metres.

Pisidium conventus Clessin. The picture presented by *conventus* is different from that of *subtruncatum* in several respects. Seventy-four dredgings brought up a total of 247 specimens. The greatest number of specimens to a dredging was 14 at 62 metres. There were only 21 specimens (9%) in water of a depth of less than 5 metres. Two hundred and twelve (86%) came from a greater depth than 12 metres. Five specimens were recovered by a dredging at 101 metres and one at 104 metres. This species also is found in various parts of the lake.

Pisidium lilljeborgi Clessin. Only five specimens of *lilljeborgi* were secured in this lake. They occurred at depths from 3 to 10 metres. The two specimens from the greatest depth were of the variety *cristatum* (equals *P. scutellatum cristatum* Sterki).

Pisidium idahoense Roper. *P. idahoense* was represented by only 17 specimens. Twelve had no depth recorded, but seem to be from shallow water. The depths at which the others were taken ranged from 2 to 36 metres. All were secured in the western half of the lake except a single specimen from the north-eastern part.

Pisidium compressum Prime. Only two dredgings contained live specimens of *P. compressum.* Both were from 1 metre. Several other dredgings brought up empty shells. All were from the western half of the lake.

The rest of the pisidia were all secured in shallow water in the western half of the lake. Those represented by whole specimens were:

Pisidium milium Held. One dredging of 3 specimens.

Pisidium pauperculum Sterki. One specimen.

Pisidium tenuissimum (?) Sterki. One specimen.

Pisidium splendidulum Sterki. Two dredgings — 7 specimens.

Pisidium abditum Haldeman. What appears to be a single valve of this species was found.

Sphaerium striatinum Lamarck. Of this species only 4 live specimens were found, all infants and all in water up to 3 metres in depth. Several lots of empty shells were also found at 1 and 2 metres. All were secured in the western half of the lake.

Sphaerium tenue nitidum Clessin. Only one specimen of this species was secured, an immature clam at 12 metres, in the western half of the lake.

Musculium transversum Say. Twelve dredgings, in the western half of the lake, brought up what appears to be a small, or stunted form of this species (the same as in Great Slave Lake), all infants, and in water from 1 to 5 metres, but mostly 2 metres.

Musculium winkleyi Sterki. What appears to be an immature *winkleyi* was found in the western end of the lake in 1 metre of depth.

DISCUSSION

Since much of the sampling of the bottom of these lakes was from water of over 5 metres in depth the species that extend out to a greater depth than 5 metres make a better showing in this report than the shallow-water species. If the samplings had been taken from 0-5 metres around the lakes, as is the custom with the usual collector, the general picture would be different (Table 1).

As shown by Table 2, the proportion of sphaeriids in the bottom population diminishes from 14.7 per cent in the upper 25 metres to 0 in depths below 300 metres. But the shallower depth zones make up a larger part of the total area of the lake than do the deeper zones (the 0-25 metre zone represents more than one-third of the total water area). Thus by weighting the averages for different zones according to their relative areas it is found that the sphaeriids constitute approximately 7 per cent of the total number of macroscopic bottom organisms.

These little clams are used as food by waterfowl, by small fish which in turn become food for larger fish like trout, etc., and by larger bottom-feeding fish. This is brought out in the report on Lake Athabaska:

Table 1

OCCURRENCE OF SPHAERIIDAE IN ATHABASKA AND GREAT SLAVE LAKES

Species	Athabaska	Great Slave
Sphaerium striatinum Lamarck	C	R
" *tenue nitidum* Clessin	R	C
Musculium transversum Say	C	R
" *winkleyi* Sterki	?	R
" *ryckholti* Normand		R
Pisidium conventus Clessin	A	A
" *subtruncatum* Malm	A	A
" *idahoense* Roper	O	C
" *lilljeborgi* Clessin	R	C
" " *cristatum* Sterki	R	R
" *medianum* Sterki or *hibernicum* Westerlund		O
" *pauperculum* Sterki	R	R
" *compressum* Prime	O	R
" *punctatum* Sterki		?
" *tenuissimum* Sterki	R	
" *lermondi* Sterki		R
" *splendidulum* Sterki	R	
" *fallax* Sterki		R
" *abditum* Haldeman	?	
" *milium* Held	R	?

A = abundant, C = common, O = occasional, R = rare.

Table 2

TOTAL MACROSCOPIC BOTTOM ORGANISMS PER SQ. M. AT VARIOUS DEPTH ZONES IN GREAT SLAVE LAKE.

Data from D. S. Rawson.

Metres	Total population	Sphaeriidae	Percentage approximate
0 - 25	2092	308	14.7
25 - 50	1688	76	4.5
50 - 100	1230	20	1.6
100 - 150	718	14	2.0
150 - 200	566	9	1.6
200 - 300	386	2	0.5
300 - 400	300	0	0
400 - 500	254	0	0
500 - 600	392	0	0

"The food of the common whitefish is mostly the shrimp *Pontoporeia* and minute molluscans. In the deeper water, *Pontoporeia* makes up about 85% of the food. In the shallower half of the lake (less than 65 feet deep), *Pontoporeia* contributes about 50% and the remainder is equally divided between minute snails and clams." (p. 77).

The distribution of these clams appears to be related to depth of water (Fig. 1) and kind of bottom material rather than to geological formation. These lakes lie across two main formations: "Thus the north and east shores are of rugged Precambrian rocks while to the south and west are found sedimentary rocks mostly overlain with glacial drift. It is of interest that Great Bear and Athabaska, the other two large lakes in the Mackenzie drainage, have similar shores since they too lie across the edge of the Precambrian Shield." (p. 45). In these two formations there is great difference in depth, particularly in Great Slave Lake: "The west and south shores, lying in the Mackenzie lowlands, are marked by low contours and exposed rocky or sandy margins.... The shallow water and the long stretches lacking harbours provide hazards to navigation in this area." (p. 50): "The deep water continues some distance into the north arm but from Yellowknife bay northwest it is quite shallow.... The depths in the east arm are quite a different story. Many places in the Hearne channel are deeper than 1,000 feet. The greatest depths yet encountered are in Christie bay north of Snowdrift, where a maximum of 2,000 feet was observed." (p. 51). The water of the Slave River enters the southern part of the lake and leaves by the Mackenzie River at the extremity of the western arm. It should be noted that most of the sphaeriids collected in Great Slave Lake were from west of a line from Taltson River to Gros Cap, i.e. in the west half of the lake including the north arm. The water in this part of the lake is warmer than in the east end because it is shallow or warmed by the Slave River or both. A number of samplings of clams were secured in the east arm but the number of specimens per dredging was small except in a few cases where they were secured in shallow water along shore.

In Lake Athabaska most of the specimens came from the south-center shore and from the west half of the lake. Of 247 *P. conventus* collected in this lake only 92 (37%) came from the north shore and east half. Of the 534 *P. subtruncatum* collected only 43 (8%) came from the vicinity of the north shore and east half, and of these 26 were from one dredging at 1 metre. Besides these there were only two specimens of *P. lilljeborgi,* two *idahoense* and one *tenuissimum* (?) found in the east half.

It would appear that the nature of the bottom rather than geological formation affects the scarcity or abundance of these little clams in one part or another of a

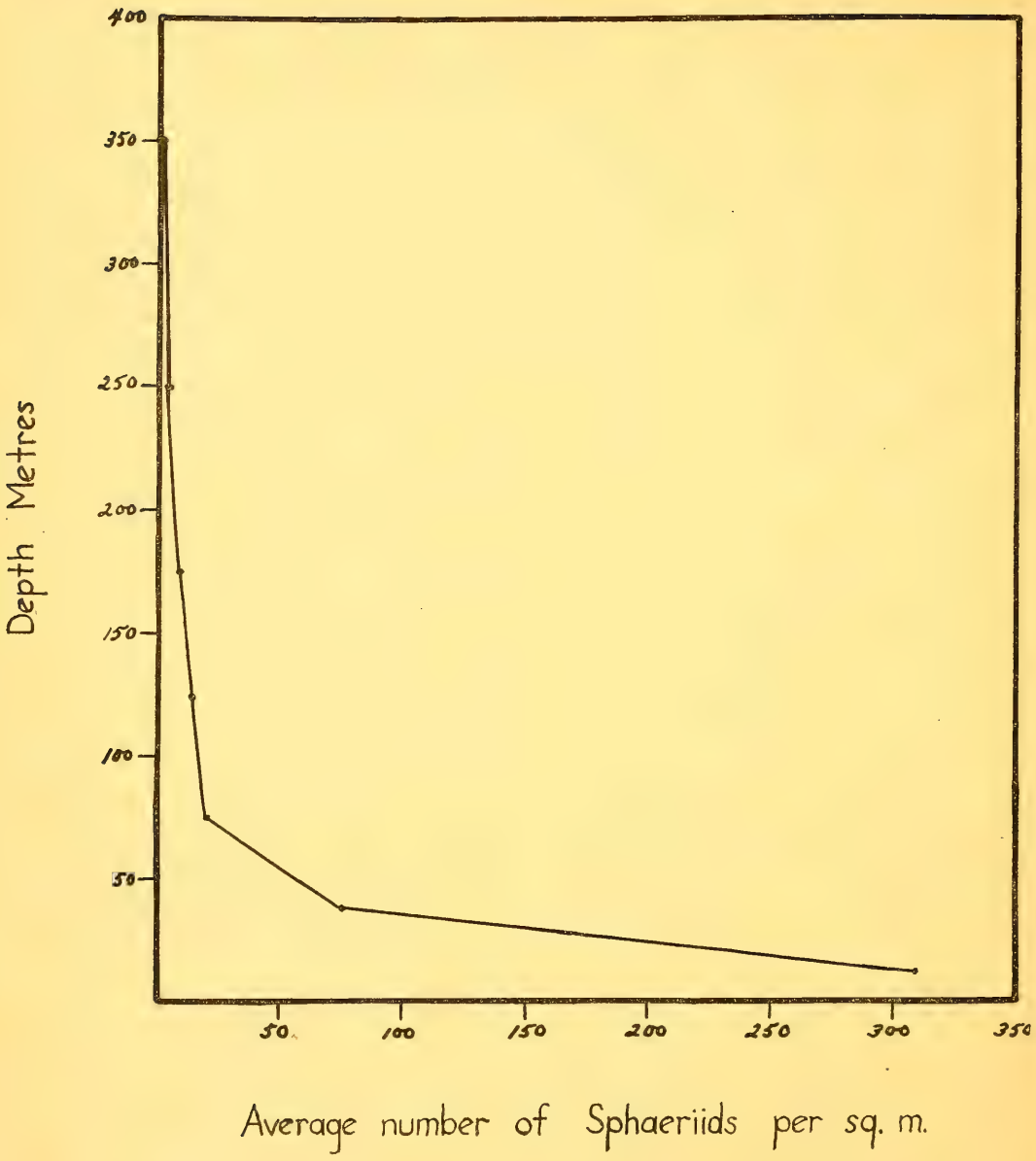

Fig. 1. Depth distribution of sphaeriids (all species) in Great Slave Lake. Data from D. S. Rawson.

body of water. Temperature also has an important effect. Along shores which are not steep the water warms up more readily and to a greater extent. This is conducive to abundance in the forms preferring warmer water, possibly through an increase in vegetable matter.

Only two of the species of Sphaeriidae found in these lakes can be described as cold-water clams — *P. conventus* Clessin and *S. tenue nitidum* Clessin. *P. idahoense* Roper may also have this status, but not enough specimens were collected to justify this conclusion.

That *P. conventus* has a preference for cold water is seen by a comparison of it with *P. subtruncatum* the other dominant species. *P. subtruncatum,* having no aversion

to warm water, maintains its relative depth ln both lakes, but a marked difference is seen in *conventus*. The temperature of Great Slave Lake has been described thus: "the surface temperature of the open lake is rarely higher than 55° F. In June it is about 40°, in July and August from 45 to 55° and in September back to 40°. Extremes of cold water are observed in McLeod Bay where on August 12, 1945, the surface was 39.5° in the centre and 45° F. near shore. The inflow from the Slave river has a warming effect over a broad area near the delta. In the river mouth and in shallow areas such as the harbour at Resolution the surface temperature rises above 62° and allows a short period of bathing. On July 27, 1945, the temperature of surface water at Resolution was 62° F. and decreased gradually away from shore until at a point 35 miles north it was only 39°." (p. 52).

But in Lake Athabaska "By mid-July the open lake is warmed to 50° or 55° and in mid-August temperatures of 60° to 66° are common in all parts of the lake. The maximum temperature, observed only in shallow near-shore areas, is about 77° F. The deep water remains cold throughout the summer ..." (p. 73).

Note the effect of this difference in temperature on the depth at which these two species were found in the two lakes. In Great Slave Lake 80% of the *subtruncatum* were dredged from less than 5 metres of water; in Athabaska 79%. But of *conventus* in Great Slave Lake 38% were dredged from less than 5 metres; in Athabaska only 9%, or 21 specimens.

It might be of interest to add that *P. conventus* was secured in Great Bear Lake by R. B. Miller; Reindeer Lake, northern Saskatchewan, by D. S. Rawson; Lac Epaula, Parc des Laurentides, Quebec, by V. D. Vladykov; Lake Nipigon, northern Ontario, by F. B. Adamstone; and Mazinaw Lake, southern Ontario, by H. B. Herrington. Specimens from all these lakes are in the writer's cabinet. The only other known North American locality for this species is Unimak Island, False Pass, Aleutian Islands, where it was collected by W. J. Eyerdam. This latter reference is recorded by Nils Hj Odhner in his paper "Sphaeriids from the Aleutian Islands" (Nautilus Vol. *52*, No. 3, Jan., 1939, p. 83).

I see no reason why this species should not be found in other deep lakes when deep dredging is done. For five summers I collected around the shores of Mazinaw Lake (about 70 miles north of Lake Ontario), without finding any indication that *P. conventus* lived in its waters. Then, for my last dredging there in 1947, I went out deeper — up to 15 metres. Of the six specimens secured in the haul four were *conventus*. In 1948 I dredged still deeper — 18 to 21 metres — and in a couple of hours I secured about 150 specimens.

The following additional information about the region of Great Slave Lake is submitted:

From Kakisa Lake, near the outlet of Great Slave Lake, Dr. W. Kennedy secured specimens of *Sphaerium solidulum* Prime, *Pisidium idahoense* Roper and what appears to be immature *Musculium partumeium* Say.

And, from bog lakes near the shores of Great Slave Lake, Dr. Oughton collected *S. tenue nitidum* Clessin, *M. ryckholti* Normand, *M. winkleyi* Sterki and, besides *P. subtruncatum* Malm, two forms of *P. abditum* Haldeman — one translucent, *P. roperi* Sterki — which may be only a subspecies of *abditum, P. splendidulum* Sterki, and what is either a form of *P. medianum* Sterki or *P. hibernicum* Westerlund. As some hundreds of the latter were collected they should aid greatly in settling the relationship, if any, between these two.

EVIDENCE OF A BREEDING SEASON

In approaching this question we are justified in taking into consideration only *P. conventus, subtruncatum, idahoense, lilljeborgi* and *S. tenue nitidum*. The other species have too few specimens to enable us to form a sound judgment. Also, since the collecting period in Lake Athabaska did not extend beyond Aug. 15, we are restricted to such information at Great Slave Lake yields.

In no case was depth of water correlated with the age of the animal; all stages of growth were found at the different depths. The dredging began in June and ended before September 15.

Infant *subtruncatum* were found uniformly from June to the end of August. Of the 16 specimens found Sept. 3, 1945, four were infants, seven half-grown, and five adults.

In the case of *conventus* most of the specimens were collected before Aug. 15. From Aug. 16 to 31 there were only nine collections. Of these my chart shows only four dredgings with any infants. Four had specimens not quite adult, and seven had adults. Of the two dredgings for Sept. 3 (20 specimens) the record is: infants none, about half-grown 11, adults 9. This suggests a summer period of bearing young, but more, and later dredgings might alter this impression.

When we turn to *lilljeborgi* and *idahoense* there is nothing to indicate a breeding season. In neither case were specimens taken in September, and infants were collected in the Aug. 16-31 period.

The situation with respect to *S. tenue nitidum* is similar. No specimens were collected in September. Of the fifty specimens collected at Yellowknife, Aug. 10, 1946, 29 were infants and 11 half-grown. Of the three dredgings Aug. 16-31 (3 specimens) one was an infant.

We may conclude that our information gives little evidence of a breeding season, with the possible exception of *P. conventus*, of which there were very few young collected in the latter part of the season.

SUMMARY

The sphaeriid fauna of Great Slave Lake includes eleven species of *Pisidium*, two of *Sphaerium*, and three of *Musculium*. *Pisidium conventus*, the dominant species, occurs in great numbers in shallow water and in smaller numbers to at least 219 metres.

Lake Athabaska has ten species of *Pisidium* (seven of which were found also in Great Slave Lake), two species of *Sphaerium* and two of *Musculium*.

The distribution of these species within the lakes appears to be chiefly influenced by temperature, depth and type of bottom.

Examination of stages of development at the time of collection gives little or no evidence of a breeding season.

In both Athabaska and Great Slave Lakes the sphaeriids are an important source of food for bottom-feeding fish.

NESTING OF THE RED CROSSBILL IN PAKENHAM TOWNSHIP, LANARK COUNTY, ONTARIO [1]

EDNA G. ROSS and VERNA M. ROSS

Almonte and Ottawa, Ontario

IN THE WINTER of 1947-48, the coniferous trees bore a heavy crop of cones in the Pakenham, Ontario, region where the following observations on red crossbills were made. The occurrence here of the red crossbills is believed to be correlated with the unusually abundant cone crop.

On December 26, 1947, crossbills which could not be specifically identified but which were thought to be red crossbills were observed briefly by Verna Ross, T. W. Ross and Douglas Deugo. Several times during the week, December 26-31, 1948, Edna Ross saw apparently the same birds feeding in the same spruce trees. They were identified as red crossbills, *Loxia curvirostra*. From five to ten were present on each occasion. Inclement weather during the first three weeks of January precluded further observations in that period. On January 21, a field trip was made but no crossbills were noted. On January 25, only two white-winged crossbills, *Loxia leucoptera*, were observed.

On February 15, Verna Ross saw four red crossbills on Cemetery Hill in Pakenham village. Two were watched at close range, a brightly-colored male and a bird of duller plumage, presumably a female. They appeared to be quite indifferent to the presence of four red-breasted nuthatches feeding in the same tree, a white pine. Later the male sang from the top of the tree. On February 29, crossbills were heard in Pakenham town-

1) Received for publication February 21, 1949.

ship by Edna Ross, Mary Stuart, Verna Ross and T. W. Ross. On the same date, crossbills were heard also on Cemetery Hill, but the birds could not be found.

On March 20, a frozen female was picked up near Cemetery Hill by A. F. Ross. This bird was sent to the National Museum and was identified by W. E. Godfrey as the eastern red crossbill, *Loxia curvirostra minor*. The skin is in the National Museum collection.

On April 4 (temperature 53°) Edna Ross, T. W. Ross and A. F. Ross took a three-mile trail from Pakenham village to the woods at the base of the Pakenham Mountains. This trail goes across open fields, through wooded areas and along a creek up the valley between two ranges of hills. They climbed "The Notch" trail through a grove of white birches to the top of the cliff. After lunch, Edna Ross descended to the base of the hill and returned on the lower trail; the other two continued along the crest of the hill.

At a point on the W½ of Lot 13, Concession 6, T. W. Ross noted a bird which flew from some shrubbery near the ground and alighted in a small evergreen about fifteen feet high and some 35 feet ahead of him. He immediately identified it as a male red crossbill. The bird appeared alarmed and flew from tree to tree uttering alarm notes. Both observers followed it cautiously for about 50 yards towards the edge of the cliff. Here three pines formed a triangle and the bird remained in this locality flying about, frequenting these three trees, and chirping almost continuously. Finally he flew into a tree in the centre of this group, a white pine about 30 feet in height. Listening carefully the observers imagined that they could hear a second bird. Meanwhile the male bird remained longer in this particular pine than in the others, literally giving himself away.

A. F. Ross discovered the nest about 20 feet up, 3 feet from the main trunk on a branch pointing almost due north. The female was on the nest. The time from the first sight of the male bird until the discovery of the nest at 11.15 a.m. was not more than 10 minutes.

T. W. Ross climbed the tree and when he reached the branch on which the nest was saddled the female flushed. The nest had one egg in it. A. F. Ross also climbed the tree to examine nest and egg. Both birds flew from the nest site and the observers left the tree and called Edna Ross who was then on the trail in the valley below. She visited the spot twenty minutes later, viewed the nest from some of the lower branches and remained behind for ten minutes but, although she heard the male bird call occasionally from the swale several rods to the rear of the nest, the pair did not return. She descended the cliff a third of the way and sat down to wait. In ten minutes the two birds flew by, the male singing his sharp, high-pitched notes. Both went in the direction of the nest.

The next day, April 5, the following members of the Ottawa Field-Naturalists' Club, Dr. O. H. Hewitt, Mr. A. E. Bourguignon, Verna Ross, Mary Stuart and Edna Ross, visited the nest site with Bill McKenzie and A. F. Ross. The day was clear, sunny and very warm (temperature 68 degrees). Maple trees were tapped and sap was running. While the observers were walking along the edge of the cliff at 1 p.m. watching for landmarks by which to locate the nest, the male crossbill flew singing into a white pine on the edge of the precipice. All members of the party viewed him with field glasses for five minutes. He was evidently a young bird as his plumage was not highly coloured. While members of the party were sitting on a rock about twenty-five feet from the nest he flew into a pine west of the nest and remained there for more than five minutes in splendid light. The female was on the nest, head turned towards the tree trunk.

Dr. Hewitt climbed to the nest and then to a point above it. The female remained on the nest and finally flushed reluctantly when Dr. Hewitt's hand was six inches from her. There were two eggs in the nest. After leaving the nest, the female flew to the top of a dead pine nearby and remained almost motionless for five minutes, giving the party a splendid opportunity to observe her. Both birds then flew away and the party divided to search the surrounding trees. Later Edna Ross heard the male singing in the swale behind the nest but the birds were not seen again that day.

On April 11, Mr. Hoyes Lloyd, Mr. Earl Godfrey, Mr. A. E. Bourguignon, Verna Ross, Mary Stuart and T. W. Ross made another trip to the crossbill nest. The day was dull, with a raw wind, and when the observers left Pakenham a thin drizzle of rain was falling which continued during the entire expedition. The temperature was 45 degrees and there was still ice on the north side of the rocky hillside where it had not been exposed to sunlight.

The male bird was not heard and did not appear, but the female was on the nest as usual. Mr. Godfrey climbed the tree and when his hand was six inches from the nest the bird flushed. She remained in nearby trees and as soon as Mr. Godfrey moved away from the nest she returned to it. There were three eggs in the nest and the female was off only one minute. No further observations were possible due to the inclemency of the weather and the party returned to Pakenham village.

On April 17, Mr. Bourguignon and Dr. Hewitt visited the nest. The male bird was not seen; there were three eggs in the nest.

At three o'clock on the afternoon of April 18, R. M. McKenzie visited the nest. The day was dull, raw, overcast and the temperature 50 degrees. The woods were fairly dry; hepaticas, trailing arbutus and bloodroot were in bloom. The male red crossbill was not seen but the female was incubating and was not easily flushed. There were two young birds and one unchipped egg in the nest. One bird was completely out and the other sitting in the half eggshell. The observer quickly left the nest site to allow the bird to return to the nest.

The evidence thus obtained is that incubation begins with the laying of the first egg, a condition which would seem not unlikely in a species which may nest in subfreezing weather. One egg was noted in the nest on April 4, the second on April 5, and it seems probable that the third egg was laid on April 6. The young hatched on April 18 which indicates an incubation period of 14 or 15 days. All observed incubation was by the female.

When Bill McKenzie visited the nest site at noon on April 24, there were no red crossbills in the vicinity. The nest was empty and only a small fragment of shell, which he collected from the base of the tree, could be found. Later in the day, Mr. Earl Godfrey collected the nest for the National Museum.

The weather during the period from April 18 to April 23 was unsettled, with cool, rainy weather, a thunderstorm during the week, and temperature ranging from the high twenties to the low fifties. April 24 was warm, sunny, with the temperature again at 68 degrees.

Many visits were made to Cemetery Hill during the next month but it was not until May 22 that red crossbills were again observed. A male red crossbill sang for five minutes from the top of a tall spruce. A second bird, presumably a female, joined him in the same tree and the two remained feeding for another five minutes before they flew away. This was the last observation made of red crossbills in Pakenham township, Lanark County, during 1948.

STATEMENT OF FINANCIAL STANDING
OTTAWA FIELD-NATURALISTS' CLUB, DECEMBER 2, 1949

CURRENT ACCOUNT

ASSETS

Balance in Bank, Dec. 2, 1949	$2631.10
Bills Receivable	68.10
	$2699.20

LIABILITIES

Audubon Screen Tours (Guarantee)	$ 725.00
O/S Cheque	5.00
Balance	1969.20
	$2699.20

RECEIPTS

Balance in Bank, Dec. 3, 1948		$2238.11
Fees:—		
Current	1494.69	
Advances and Arrears	195.48	
Assoc. Members	45.00	
		1735.17
Separates		458.69
Illustrations		30.00
Single and Back		225.90
Miscellaneous		42.28
Audubon Screen Tours (Net)		1336.76
		$6066.91

EXPENDITURES

Can. Field-Nat.		$1937.60
Editor		100.00
Business Manager		15.00
Separates		403.16
Macoun Club		20.00
Illustrations		172.00
Postage and Stationery		168.60
Bank Discount		21.98
Exc. and Lectures Comm.		75.00
Membership Comm.		83.43
Lodge Building		300.00
Miscellaneous		94.04
Balance in Bank	2631.10	
Less O/S Cheque	5.00	
Corrected Balance	2626.10	2626.10
		$6066.91

RESERVE FUND

ASSETS

Canadian Govt. Bonds	$1800.00
Balance in Bank, Dec. 2, 1949	71.86
	$1871.86

LIABILITIES

NIL

RECEIPTS

Balance in Bank, Dec. 3, 1948	$ 7.54
Bond Interest	69.00
Bank Interest	.32
	$76.86

EXPENDITURES

Rent Deposit Box	$ 5.00
Balance in Bank, Dec. 2, 1949	71.86
	$76.86

PUBLICATION FUND

ASSETS

Canadian Government Bonds	$1300.00
Balance in Bank, Dec. 2, 1949	256.11
	$1,556.11

LIABILITIES

NIL

RECEIPTS		EXPENDITURES	
Balance in Bank, Dec. 3, 1948	$ 53.56		
Bond Interest	51.00		
Bank Interest	1.55		
Life Memberships	150.00	Balance in Bank, Dec. 2, 1949	$256.11
	$256.11		$256.11

Audited and found correct
(Signed) **Harrison F. Lewis,**
I. L. Conners,
Auditors.

C. Frankton,
Treasurer.

December 2, 1949.

ANNUAL MEETING OF THE OTTAWA FIELD-NATURALISTS' CLUB, 1949

REPORT OF COUNCIL

Since the last Annual Meeting there were seven meetings of Council as follows, all held at St. Patrick's College: December 17, 1948, with 22 members present; January 26, 1949, with 16 members present; February 28, with 18 members present; March 25, with 13 members present; May 19, with 17 members present; October 21, with 16 members present; November 22, with 14 members present. A special meeting was also held on September 27, with 17 members present, for the purpose of discussing the report of the Constitution and By-laws Committee.

Appointments were made for 1949 as follows:

Editor of the Canadian Field-Naturalist— Dr. H. A. Senn.

Business Manager — W. J. Cody.

Chairman of Publications Committee — A. E. Porsild.

Chairman of Excursions and Lectures Committee — E. G. Anderson.

Chairman of Special Lectures Committee —Dr J. W. Groves.

Chairman of Membership Committee — Dr. V. E. F. Solman.

Chairman of Reserve Fund Committee — E. F. G. White.

Chairman of Bird Census Committee — A. E. Bourguignon.

Chairman of Constitution and By-laws Committee — Father F. E. Banim.

Chairman of Library Committee — A. E. Porsild.

Chairman of Macoun Field Club Committee — W. K. W. Baldwin.

Chairman of Building Committee — A. E. Bourguignon.

A special feature of the year's activities was the construction of a lodge near Beattie Point on Lake Deschenes, about 15 miles from Ottawa, to serve as a field headquarters. This lodge, formally opened last Spring, has been used by many members and their friends, as well as for Club excursions and outings of the Macoun Field Club. Mr. A. E. Bourguignon has earned the thanks of all members for his enthusiastic and able direction of this project, an account of which will appear in a future issue of the Canadian Field-Naturalist. Members and their friends are invited to make the fullest possible use of the new lodge.

Report of Publications Committee

During the period December 1, 1948, to December 1, 1949, seven numbers of the Canadian Field-Naturalist were published. This included No. 6 of Volume 62, with 36 pages, and Nos. 1-6 of Volume 63, with a total of 262 pages. Thus 298 pages were published in 1948-49, as against 213 pages in 1947-48. Papers, notes and reviews were distributed as follows:

	Papers	Notes	Reviews
Ornithology	12	25	4
Botany	11	6	1

Mammalogy	5	2	2
Invertebrate Zoology	4	—	—
Palaeontology	2	—	—
Herpetology	1	2	1
Ichthyology	1	—	3
Miscellaneous	6	2	3

Seven maps and 21 other illustrations were used.

The business manager reported sales of back numbers totalling $225.00, including an almost complete set of the "Naturalist" to the University of Oklahoma. He also reported that a set had been ordered by the University of Arkansas.

Report of the Excursions and Lectures Committee

Seven meetings of the Committee were held during the year, at which plans were made for the regular Club activities and approval given to 23 applications for Associate membership. Three indoor meetings were held as follows:

March 10 — At a meeting held in the auditorium of the National Museum of Canada, Dr. H. A. Senn gave a talk, illustrated with kodachrome slides, on his trip to South America during the fall of 1948 to attend the Second South American Botanical Congress.

April 21 — The Annual Dinner held at the Central Experimental Farm was greatly enjoyed by all attending. The programme consisted of a display of Natural History subjects prepared by the Macoun Field Club, members of which were in attendance to explain the exhibits. The evening closed with the showing of a film in colour entitled "Birds near Home".

November 3 — A Member's Night was held in the auditorium of the Ottawa Normal School. Informal talks were given by various members, coloured films were shown by Messrs. Groves, Conners, Drzewiecki and Anderson, there was a display of dyed wools by Miss E. Ross, and snapshots of the Club's activities were exhibited.

Two special meetings were held as follows:

May 24—The lodge at Lake Deschenes was officially opened in the presence of over 65 members. Following a picnic dinner, the members spent the rest of the day exploring the district.

June 7 — An evening excursion to Rockcliffe was held under the leadership of Mr. W. I. Illman.

There were eight meetings of the Bird Group, with an average attendance of 26 members. The programmes included discussion of bird observations, talks and pictures of trips taken by members, studies of the various species of birds seen in the district and of the preparation of dry skins. Four early morning bird walks were held, under the leadership of Messrs. Savile, Groves, Bourguignon and Frith.

Seven Saturday afternoon excursions were held as follows:

May 7—Rideau River and Billings Bridge.
May 14—Central Experimental Farm.
May 28—Val Tetreau.
June 4—Britannia.
Sept. 10—Wiener Roast at the Lodge.
Sept. 17—Hosts to Macoun Field Club at the Lodge.
Sept. 24—Bird Group at the Lodge; Botany Group at the White Bridge.

A new venture was the inauguration of the Newsletter, four issues of which have been distributed, and which have been well received by members. Plans have been made to have it continued.

Report of Special Lectures Committee

Three Audubon Screen Tours completed the series initiated in the Fall of 1948. These were:

January 8—Midnight Movies in Animaland, by Howard Cleaves.

February 9 — Happy Valley, by Tom and Arlene Hadley.

March 29—Athabaska Sojourn, by O. S. Pettingill.

Following the encouraging reception of the 1948-49 series, the Committee drew up plans for a series in 1949-50, including free matinee programmes to be held in some of the Ottawa secondary schools. Two of this series have already been held, as follows:

October 13—Bits of Land along the Coast, by Telford H. Work.

November 24 — South along the Suwannee, by Allan Cruickshank.

The response to this second Audubon series, which will include three more lectures, has been most encouraging.

Report of Membership Committee

As a result of a meeting and many informal discussions during the Spring of 1949, the Committee agreed that a drive for local

members should be launched, and produced a pamphlet for use in this campaign. Several hundreds of these pamphlets were distributed at the Annual Dinner held in April. A mailing list of over 2,100 names was assembled through the co-operation of numerous local organizations and by collecting names and addresses at the last Audubon lecture held in March. Over 2,100 pamphlets were sent out by mail during May.

Since the last annual meeting, 23 associate members and 28 active members, as well as 3 life members, have joined the Club. A full set of The Canadian Field-Naturalist was sold as a result of the 1948 campaign.

The Audubon Screen Tour series and the new Lodge have undoubtedly aided in attracting interested persons to the Club. The help of the Press in providing valuable publicity for both the Audubon series and the membership campaign must also be acknowledged. The business manager has sent out 66 sample copies of the Field-Naturalist to various institutions.

Report of the Bird Census Committee

The Christmas Bird Census was taken on January 2, 1949. A total of 29 species and 2,012 individuals was reported; 21 members participated. The Bird Census Report for all of Canada was published in the March-April issue of The Canadian Field Naturalist.

Report of the Constitution and By-laws Committee

A proposed amendment of the constitution of the Ottawa Field-Naturalist's Club was published in the November-December 1949 issue of the Canadian Field-Naturalist, accompanied by notice of a motion to be presented at the present annual meeting.

Report of the Library Committee

A year ago, members of the Committee, with Mr. Jennings, Chief Librarian of the Ottawa Carnegie Library, made an examination of the Ottawa Field-Naturalists' library stored there. A preliminary list of some of the more important items was made. Of chief value are some broken runs of various Natural History periodicals, etc. After consultation with members of the Committee, the chairman undertook to prepare a complete list that, in due course, will be circulated to various Ottawa libraries.

Report of the Macoun Field Club Committee

This Natural History club for boys and girls of school age continued into its second year under the joint sponsorship of the National Museum of Canada and the Ottawa Field-Naturalists' Club.

Thirty meetings were held in 1949. These included ten excursions to points of interest in the Ottawa district. Indoor meetings were held in the special project room at the National Museum, and were timed to include the eight programmes in the 1949 Museum Saturday Morning Series.

On February 26th the Macoun Field Club assisted Dr. Douglas Leechman in the Museum program "Oh! What a Face". On April 20th, the Club showed an exhibition of their work at the Annual Dinner held at the Central Experimental Farm. This exhibit was shown later at a special meeting at the Museum, on April 30th, for sponsors, parents and friends. At this meeting, Miss Mary Macoun Kennedy presented badges to the boys and girls who had qualified. The Club in turn presented souvenir badges to the Curator of the Museum and the President of the Ottawa Field-Naturalists' Club. On June 4th, the Club made a bus excursion to Kingsmere, where Mr. and Mrs. Selwyn H. Wilson gave a picnic lunch at their cottage. On October 1st, the Club showed an exhibit at the Youth Week Hobby Show held in Lansdowne Park. The Club has supplied ushers from among its members for the second Audubon Screen Tour series.

(Signed)

Pauline Snure, President. **H. J. Scoggan,** Secretary.

SUPPOSED NATURAL HYBRID BETWEEN AGROPYRON AND HYSTRIX [1, 2]

W. G. DORE

Division of Botany and Plant Pathology, Science Service, Department of Agriculture, Ottawa

A TALL TUFTED GRASS with the general appearance of *Agropyron trachycaulum* was collected in open deciduous woods on the shallow precambrian bed-rock of the south-facing slope of the escarpment about 15 miles northwest of Ottawa in Eardley Parish, Gatineau County, Quebec, on July 8, 1948. The specimen bears the collection number: *8617 W. G. Dore and B. Boivin.* In the following discussion it will be referred to as "the Hybrid". Also collected at the same site were specimens identified as *Agropyron trachycaulum* (Link) Malte var. *glaucum* (Pease & Moore) Malte (*No. 8619 Dore & Boivin* and *Hystrix patula* (L.) Moench var. *Bigeloviana* (Fernald) Deam (*No. 8623 Dore & Boivin*). These latter two specimens, the suspected parents, will be referred to respectively as "the *Agropyron*" and "the *Hystrix*". Spikes of these three plants are shown in Plate 1.

In the Hybrid the spikelets occur singly at the nodes of the rachis, except in one spike (of the six available) with two spikelets at the second to lowest node. In the *Agropyron* the spikelets are single and in the *Hystrix* paired at the rachis nodes. On a dead stem still attached to the crown of the Hybrid, however, every node of the shattered spike, except the lowermost, bears two pairs of glumes, indicating paired spikelets on the same plant in the year previous. The rachis internodes in the Hybrid are intermediate in thickness between the thin ones of *Hystrix* and the thick ones of *Agropyron.* The spikelets show no tendency to diverge from the rachis as in *Hystrix.*

The glumes in the Hybrid show greater variability in size, shape and arrangement than ordinarily expected within a single spike. An average glume is slender, 10 mm. long by 0.7 mm. broad, indurated, thick at the margins, 3- or 4-nerved and tapers gradually into a long awn-point. In the *Agropyron* the glumes are broader, 8 to 9 mm. long, about 1.5 mm. broad, 5- to 7-nerved, scarious margined and abruptly tapered into short awns less than 1 mm. long. In the *Hystrix* the glumes are absent or abortive and present as minute points less than 0.5 mm. long. Certain irregularities in the glumes of the Hybrid may be listed as follows: glumes of the terminal spikelet only, awn-like, 2 to 4 mm. long and 0.2 mm. broad; an awn-like tooth, 0.5 to 1.0 mm. long, projects from the edge of the glume at the base of the awn in about 50 per cent of glumes; a "glume-lemma" appears in a few of the spikelets, attached to the rachis (not to the rachilla) between the glumes and composed of two longitudinal segments, one nerveless and strigose similar to a lemma and the other nerved and glabrous similar to a true glume. This "glume-lemma" generally subtends a floret.

Lemmas of the Hybrid are sparsely strigose, intermediate between the densely strigose lemmas of the *Hystrix* and the glabrous or scabrous lemmas of the *Agropyron.* The callus is prominent, but not as prominent as in the *Hystrix.* The awn is much shorter than in the *Hystrix* but slightly longer than in the *Agropyron.*

In the *Hybrid* the anthers are cream coloured, wrinkled, 2.3 to 2.5 mm. long and contain abortive pollen grains. In the *Agropyron,* which is just past flowering and the caryopsis starting to grow, the spent anthers are 1.5 to 1.7 mm. long, their few adhering pollen grains all round and filled with starch. In the *Hystrix,* in a stage just before anthesis, the anthers are yellow, smooth, 3.7 to 3.9 mm. long and contain pollen grains which are at least 95% good.

It is impossible to classify this supposed hybrid (*No. 8617 Dore & Boivin*) with any grass yet described in Eastern Canada. Since it is pollen-sterile, exhibits variability in the number of spikelets per node in subsequent seasons, exhibits considerable variability in the size and outline of the glumes within the spike, possesses "glume-lemma" structures, and has various features intermediate between two putative parents growing in close

[1] Received for publication April 14, 1949.
[2] Contribution No. 984 from the Division of Botany and Plant Pathology, Science Service, Dominion Department of Agriculture, Ottawa, Ontario.

proximity, it is highly probable that it is of intergeneric hybrid origin. Without indicating which is the female parent, the hybrid may be designated: *Agropyron trachycaulum* var. *glaucum* x *Hystrix patula* var. *Bigeloviana.*

It is not known whether additional plants of this hybrid or the two parents still persist at the original locality, but, if so, cytological examination should add pertinent information. At the same site another specimen of *Apropyron trachycaulum* var. *glaucum (No. 8618* and one of *Hystrix patula* (L.) Moench *(No. 8610)* were also collected. In the latter the lemmas are glabrous and it is, therefore, thought not to figure in the parentage of the hybrid. All specimens referred to are preserved in the herbarium of the Division of Botany and Plant Pathology, Department of Agriculture, Ottawa.

THE PRODUCTIVITY AND SEX SURVIVAL OF ELK BANFF NATIONAL PARK, ALBERTA [1]

HUBERT U. GREEN
Banff National Park, Alta.

INTRODUCTION

DUE to the overutilization by elk of the Bow River range of the Banff National Park, Alberta, it was decided by the National Park Service in 1944 to remove by non-selective slaughter a predetermined number each year until range-carrying capacity was in balance with population.

During the winters of 1944-45, 1945-46, 1946-47 and 1947-48, a total of 1,130 elk were destroyed by shooting on the open range during the months of November, December and January and the salvaged carcasses, numbering 1,093, conveyed to park headquarters at Banff for dressing, storage, and disposal to the Department of Indian Affairs.

As the opportunity for performing autopsies on large samples of elk from year to year was unusual, and the quantitative data that could be derived from post-mortem examination should be of great interest, the author, a member of the National Park Service, was detailed for this work. Particular emphasis was placed on the desirability of building up comparative productivity and primary sex ratio records in order to establish the survival trend between conception and the age of about 6 months and between the ages of about 6 months and rising 2 years, and the sex ratio of both age groups. It was believed that as the annual samples were not selected they would be representative of the herd during the winter months.

[1]) Received for publication March 7, 1949.

HABITAT

The winter elk range of the Bow River within the Banff National Park, utilized sparingly by moose, bighorn sheep, and mule deer during the summer months, covers the valley of the river between East Gate and Louise, a distance of approximately 48 miles. About two-thirds of the valley is mixed forest of lodgepole pine *(Pinus contorta),* white spruce (*Picea glauca*), Engelmann spruce (*Picea Engelmanni),* Douglas fir (*Pseudotsuga taxifolia*), and aspen poplar (*Populus tremuloides),* with lodgepole pine the overall dominant type. The remainder is open and semi-open meadowland, with areas of grassy ridges and alpine meadows to near timberline. The valley averages about one mile in width and is well watered by a number of creeks draining the surrounding mountain slopes and tributary valleys on either side. The average elevation of the valley floor is 4,706 feet above mean sea level, and the surrounding mountains rise to an elevation of between 7,000 and 9,000 feet. Situated in a semi-arid zone, summer precipitation is comparatively light. Winter snowfall is variable. It is heaviest at Louise with from 9 to 15 feet par annum, and lightest at East Gate with an average of 3 feet or less, a circumstance that causes higher concentrations of elk at the middle and east end of the range when deep snow conditions prevail to the west. The Canadian Pacific Railway traverses the valley from East Gate to Louise. The Banff-Louise-Jasper highway closely parallels the railway to Louise.

Plate 1. Spikes of supposed wild hybrid and parents. (1) **Agropyron trachycaulum** var. **glaucum,** specimen No. 8619. (2) The supposed hybrid, specimen No. 8617 : A spike of current season, B. spike of previous season attached to same plant. (3) **Histrix patula** var. **Bigeloviana,** specimen No. 8623. Natural size

The number of elk wintering from year to year on the range described is estimated from the interpretation of census data to be at least between 750 and 1,000 head.

MORTALITY FACTORS

A family group of wolves, estimated to be between 9 and 12 in number, hunted the Bow River range during the winters of 1946-47 and 1947-48. Prior to the winter of 1946-47, wolf tracks were occasionally seen, and individual wolves were observed from time to time after the arrival of elk from the summer range. Wolves were also observed at all times of the year in and about other widely-separated ranges in the park which were frequented by elk. The predator-prey relationship of wolves occurring on the Bow River range is at present incompletely known. However, in the absence of buffer prey during the winter months, the wolf pressure on elk at this time is believed to be relatively heavy, judging from the number of kills discovered.

Some elk kills have been observed during the winter months which indicated that a cougar was involved. Observation records show that a few cougars frequent the Bow River range from time to time at all seasons of the year.

The range also supports what is considered a normal population of black bears and coyotes, both of which species are known to prey to some extent upon elk calves during the early days of infancy.

Two mechanical factors are present: destruction by shooting, previously discussed, and the mortality incurred by being struck by locomotives on the railroad track traversing the range. In the Spring of 1947, a survey of the track between East Gate and Louise revealed the carcasses of 45 elk of all age and sex groups that had been killed by passing trains during the previous winter.

As a heavy calf loss between conception and the age of about 6 months was evident early in the study, infection by *Bacillus abortus* was suspected as a possible lethal factor. During the slaughter of 1946-47, 187 samples of elk blood from all age and sex groups were collected in the field and the sera tested by the Animal Disease Research Institute, Hull, Quebec. The results were negative.

METHODS EMPLOYED

All carcasses brought in from the field were tallied according to age and sex, and recorded on individual record sheets on daily arrival at the dressing and storage sheds, Banff. The sample total of all age and sex groups was computed at the end of each slaughter season (Table 1).

Pregnant and non-pregnant females were segregated as indicated in Table 2.

Fetuses were removed from all gravid uteri and the sex determined. When sex could not be determined due to incomplete differentiation of the primitive external sex apparatus, it was recorded as undetermined (Table 3).

TABLE 1 — NUMBER AND COMPOSITION OF ELK AUTOPSIED

Season	No.	Over 2 yrs		Rising 2 yrs		Calves	
		♂	♀	♂	♀	♂	♀
1944-45	200	—	117	—	—	—	—
1945-46	352	56	198	24	19	30	25
1946-47	297	50	152	19	17	36	23
1947-48	244	13	165	15	11	21	18

TABLE 2 — PRODUCTIVITY

Season	Females autopsied	Pregnant	Non-pregnant
1944-45	117	109	3
1945-46	198	149	49
1946-47	152	113	39
1947-48	165	125	40

TABLE 3 — PRIMARY SEX RATIO

Season	Number fetuses examined	Sex ♂♂	♀♀	Und.	Ratio ♂♂:♀♀
1944-45	110*	58	48	4	121:100
1945-46	149	66	67	16	97:100
1946-47	113	58	52	3	112:100
1947-48	125	61	52	12	117:100

* Number includes one twinning.

TABLE 4 — COMPARATIVE SURVIVAL

Season	Pregnant	Ratio ♂♂:♀♀	6 months	Ratio ♂♂:♀♀	R. 2 yrs	Ratio ♂♂:♀♀
1944-45	109	121:100	55	120:100	36	111:100
1945-46	149	97:100	59	156:100	27	145:100
1946-47	113	112:100	39	145:100	—	———
1947-48	125	117:100	—	———	—	———

Using the data derived from Tables 1 and 2 as the basis of comparison beginning with the season 1944-45, the number of calves progressively tallied each season in relation to the number of pregnancies occurring would indicate the annual loss trend between conception and the age of about 6 months. Applying the primary sex ratio would similarly indicate the annual sex survival to this age. The number of yearlings (rising 2 years olds) tallied in the samples following would progressively indicate the survival trend from the age of about 6 months to the age of one year, together with the sex ratio (Table 4).

CONCLUSIONS

The primary sex ratio, the ratio at the age of about 6 months, and the ratio at the age of rising 2 years follow the same pattern, there being a preponderance of males in every case with the exception of the fetuses examined in 1945-46.

High productivity is indicated, 78 per cent pregnancies occurring in 632 females of breeding age examined.

The mortality between conception and the age of about 6 months is unexplained. In the absence of infection by *Bacillus abortus* it is probably largely post-natal, — death at parturition, or due to inclement weather at the time of the birth, or to predation.

The mortality indicated between the ages of about 6 months and one year may be attributed to the hazards encountered during the first winter of life, which are known to exact a heavy toll in the low age group of other park game mammals.

FIVE NEW COMPOSITAE FROM YUKON — ALASKA[1]

A. E. PORSILD
National Museum of Canada, Ottawa

Aster elegantulus n.sp.

Perennis rhizomate brevi.—Caules foliosi, 30-40 cm solitarii vel aggregati, graciles, simplices, ubique pubescentes. — Folia caulina 15-20 integra revoluta linearia, 2.5 - 3.0 cm long., 1.5 - 2.0 mm lat., sessilia nec tamen amplexicaulia neque auriculata, superna uniformitas appresso-pubescentia, inferna glabra.— Rami 3-6 cm graciliores, caput apicale latius ferentes et lateralia 1-3 in ramis reductis. — Capita parva 10-15 mm lat., 10 mm alt. — Phyllaria biseriata aequilonga, glabra sive in margine subscabra, lanceolata acuta, externa viridia, summa interna viridia basi alba uninervia, 6 mm long., 1 mm lat. — Ligulae ca. 16 in capite, 8 mm longae, 1.0 - 1.5 mm latae albae vel sublilacinae, tenue trinerviae, spathulatae, summae obtusae, dentibus 3 minutis plus minus crispis. — Flores disci ca. 20 in capite, 5 mm longi, lilacini; pappus minute barbellatus albus, 3 mm longus. — Achaenia 1 mm longa setigera.

Whitehorse, in open aspen woods on clay banks east of Lewes River, with flowering and fruiting heads on July 28-29, No. *10703*[2] (type); Sheep Creek, Alaska-Yukon Boundary, July 21, 1936, E. & J. Lohbrunner. Thus far known only from the above mentioned stations.

Aster elegantulus, with its slender, narrow-leaved stems and few-flowered, graceful and delicate inflorescence superficially resembles *A. junciformis* Rydb. but differs from that species, as well as from the Eastern *A. junceus,* by its densely caespitose growth form, by its evenly pubescent stem, and by its phyllaries which are of equal length and arranged in two series. In *A. junciformis* and *A. junceus,* the rhizome is very slender and creeping, the stems are conspicuously striped with appressed hairs and the phyllaries are of unequal length arranged in three series[3].

Senecio sheldonensis n.sp.

Planta perennis gracilis et glaberrima e rhizomate brevi pluricipito, sed mox emarcido, radicibus fibrosis multis sustentata. — Rosulae steriles foliorum desunt. — Caules foliiferi et floriferi simplices erecti, 30-40 cm alti.—Folia ad 10 late-lanceolata, repando-denticulata, apicibus dentium subincrassatis, glabra satis firma venis subobscuris, inferiora conspicue petiolata, 6-10 cm longa (petiolis inclusis), superiora sessilia plus minus amplexicaulia, valde reducta.—Inflorescentia cymosa saepissime ex tribus (? 4) calathüs longe-pedunculatis. — Calathia turbinata, 12-17 mm alta, ca. 8 mm lata.—Involucrum ca. 10 mm altum glabrum, phyllarüs ca. 12 linearibus firmis, marginibus latis hyalinis apicibus attenuatis, conspicue obscuris pubescentibusque. — Radii lutei, ligulis 10 mm longis 1 mm latis obtusis. — Disciflosculi lutei pappum album superantes. Achaenia glabra.

South shoulder of Mt. Sheldon, in open timberline forest in saddle between Mt. Sheldon and Mt. Riddell, elev. 4500', August 10, 1944, No. *11689* (type); northeast spur of Mt. Sheldon, in subalpine meadows near Mile 226, No. *11492.* Also from Mayo District, McArthur Mts., near the hot springs, elev. 4200', Bostock, No. 196, and mountain north of McQuesten R., alpine meadow, 4700' elev., Christie, No. *126;* McQuesten Area, head of Sunshine Creek, 4000' elev., Campbell, No. *472.* Also northern British Columbia: Bennett, Malte, No. *56;* Haines Rd., Mile 85, Clarke, No. *438.*

Senecio sheldonensis is perhaps most closely related to the Eurasian *S. nemorensis L.,* particularly to the few-headed var. *macer* (DC.) Printz., Veg. Sib.—Mong. Frontier. 428, tab. 14, (1921). (*S. octoglossus* var. *macer* DC. in Prod. 6:354 (1837)) from Altai Mts. from which it is, however, amply distinct by its fewer and upwards much reduced, acute rather than long-acuminate stem leaves and by its broader and longer, non-ciliate phyllaries, shorter ligules, etc.

From the somewhat polymorphous *S. triangularis* Hook. and its var. *trichophyllus* Hardin & St. John in Mazama 11:95 (1929), which is *S. saliens* Rydb. in Torr. Bot. Cl.

[1]) Received for publication December 2, 1949.
[2]) Throughout the text of this paper serial numbers not preceded by the collector's name refer to specimens collected by A. E. Porsild and A. J. Breitung, in 1944, in the course of a botanical survey of the country adjacent to the Canol Road and pipeline of southeastern Yukon.
[3]) Professor M. L. Fernald, who kindly examined our plant, believes it "a clear new species, nearest related to **A. junciformis** Rydb. but with much smaller and few-flowered heads, very narrow and short leaves and more racemose-paniculate habit" (Fernald, in litt.)

24:298 (1897) and also *S. prionophyllus* Greene in Ott. Nat. 15:250 (1902), as well as from *S. triangularis* var. *angustifolius* Jones in Univ. Wash. Publ. in Biol. 5:257 (1936), *S. sheldonensis* differs by its more slender growth, weaker rhizomes, few-leaved stems and by its always lanceolate, never triangular-hastate, and barely dentate leaves and by its dark-tipped phyllaries.

On Mt. Sheldon *S. sheldonensis* grew in subalpine meadows associated with *Delphinium glaucum, Thalictrum sparsiflorum, Heracleum lanatum, Mertensia paniculata,* etc., in rather dry, turfy places quite unlike those preferred by *S. triangularis.*

No. *11689* had almost mature fruits on Aug. 10, whereas, on a somewhat later and more shaded habitat, No. *11492* was in full bloom on Aug. 8.

Senecio yukonensis n.sp.

S. sp. Porsild in Nat. Mus. Can. Bull. **101**:28 (1945).

Perennis caudice ascendente rosulas steriles nonnullas gerente. — Folia radicalia numerosa carnosula, 4-6 cm longa, eorum partes dimidiae petioliformes basi gradatim perdilatatis tenuissimis subcaerulescentibus, laminae lineari-oblongae vel oblanceolatae, 0.8 - 1.0 cm latae, integrae vel obscure repando-denticulatae, juventute subtus floccoso - lanatae, serius glabratae. — Caules floriferi singuli aut rarius bini vel terni ex eodem caudicis ramo, sat robusti, 10-20-(30) cm alti, erecti aliquantum flexuosi, viridi - purpurascentes costati, juventute tenuiter arachnoideo-floccosi, serius glabrati, foliis sessilibus 4-7 linearibus, superioribus reductis. — Calathia rarius singula, saepe terna vel quaterna cymosa, in anthesi plus minus congesta, lateralia saepe reflexa vel etiam nutantia, maturitate pedunculis 2-6 cm longis lano lutescente dense indutis. — Hypanthium pilis lutescentibus moniliformibus dense lanatum, maturitate glabrescens. — Phyllaria linearia longe attenuata, obscure viridia vel nigrescentia, lutescentilanata, maturitate glabrata. Radii ligulis lanceolatis ca. 1 cm longis pallide luteis 3-ad 5-veniis; corollae flosculorum disci luteo-fuscae pappum sordide-album vel pallide rufescentem valde superantes. — Achaenia 3 mm longa valde costata glabra.

Pass between Teslin and Nisutlin Rivers, mossy alpine summit of mountain east of Mile 14, Nos. *11017* and *11055;* same place, M. P. & R. T. Porsild, No. *702;* alpine slopes east of Rose River, Mile 77, No. *10963;* mossy north summit of granite moutain east of upper Rose River, Mile 85-90, elev. 6000', No. *10187* (type); alpine slopes west of upper Rose River opposite Mile 95, elev. 6000', No. *10226;* same place, in dry, alpine heath, No. *10580;* north shoulder of Mt. Sheldon, in alpine mossy heath, elev. 6000', No. *11096;* south shoulder of Mt. Sheldon, alpine heath on rocky ledges, elev. 6000', No. *11638;* northwest end of Itsi Range, alpine slopes south of Mile 252, No. *11393;* in mossy places on gravelly summit of shale mountain west of upper Macmillan River, Mile 268, elev. 6000', No. *11376;* Macmillan Pass, Yukon-Mackenzie Divide in alpine tundra near Mile 284, No. *11275.* Also mountains north of McQuesten R. on dry grassy summit, 5700' elev. Christie, No. *101;* McQuesten Area, Little Klondike R., 5800', Campbell, No. *696;* on east slope of Mackenzie Range, N. W. T., high, alpine ridge west of head of Bolstead Creek, Mile 111 E., V. C. Wynne-Edwards, No. *8402.* Also from a single collection from Alaska: Eagle Summit, Lepage, *25363* (Can.)

Senecio yukonensis is a truly alpine species, which apparently is endemic to high mountains of central Yukon and Alaska where is not uncommon in mossy heath, far above timberline. Flowering specimens were first noted early in July and fruiting heads a month later. On Aug. 31, in large wintering buds concealed amongst the withered leaves, next year's inflorescences were in far advanced state of development.

Senecio yukonensis probably belongs in the section *Integerrimi* (Rydb., Rc. Mt. Fl.) in which are placed *S. integerrimus* Nutt., *S. Hookeri* T. & G., *S. exalatus* Nutt., and others; but it is probably not closely related to any of these, or to any other N. American member of the genus.

Taraxacum pellianum n.sp.

Planta minor e sectione *Ceratophora* Dahlst. Radix primarius verticalis crassus capite pluricipita, scapis florigeris 2-3 et rosulis sterilibus paucis coronatus. — Folia glabra, firmula, nervo medio purpurascente, laete-viridia in petiolum angustata, priora 2.5 - 3 cm longa subintegra lanceolata, posteriora 6-8 cm longa, 8-10 mm lata, marginibus plus minus dentatis, runcinatis aut etiam hamatis, deinde superiore tertia parte lami-

nae plus minus integra et sensim acutata. — Scapi 8-10 cm alti erecti, initio purpurascentes, deinde stramineo-virides glaberrimi, apicibus araneosis exceptis. — Involucrum ca. 15 mm altum viridi-olivaceum, phyllariis apice distinctissime cornutis. — Calathia florescentia parce expansa, ca. 25 mm lata, floribus pallide aureis splendentibus, antheris luteis obscurioribus, polline praeditis. — Achaenia parum matura stramineo-brunnea apicibus grosse muricatis, 4.24 mm. longa, pyramides 0.75 mm, rostra 4.50 mm longa.

Rose-Lapie Pass, rocky ledges on mountain west of Mile 116, Nos. *10101* and *10155;* lower Lapie River, dry shaly slopes of mountain west of Mile 132, elev. 5000', flowering specimens on June 20, No. *9760* (type); same place, rocky ledges in a ravine, No. *9498;* rocky summit west of Mile 132 elev. 5000', No. *9956.* Also McQuesten Area: Pelly R. flats near Pelly farm, Campbell, No. 74.

Taraxacum pellianum undoubtedly belongs in the section *Ceratophora* Dahlst, and perhaps is closely related to *T. hyperboreum* Dahlst. the type of which came from King William Island, N.W.T. Our plant grows in small tufts bearing numerous erect rosette leaves and usually but one scape; the tap-root is stout for a plant of its size and its crown is densely covered by the remains of last year's leaves. The leaves of the early rosette stage are mostly entire and narrow.

Our plant appears to be restricted to sunny, calcareous shale slopes of the Pelly Range where it flowered from June 15.

Hieracium gracile Hook. var. **yukonense** n.var.

Differt radice magis producta et ferente rosettas densas foliorum firmiorum, caulibus floriferis 30-45 cm alt., 2-3 mm diam., firmis, gaudentibus 10-15-(30) capitum subumbellatorum latorum in pendunculis longis gracilibus atrovillosis.

South shoulder of Mt. Sheldon, in old burns on timbered lower slopes in saddle between Mt. Sheldon and Mt. Riddell, elev. 4500', No. *11693* (type); same place, grassy slopes above timberline, No. *11646;* northeast spur of Mt. Sheldon, in subalpine meadows near Mile 226, No. *11499;* upper Rose River, river flat meadows near Mile 95, No. *10427.*

The var. *yukonense,* by its stout and tall stems, many-headed inflorescence and large, leafy rosettes, differs strikingly from the low, few-headed *H. gracile.* From *H. triste* it differs by the presence on the peduncles of stalked glands and by the basal leaves which are glabrous, oblanceolate, sharply acuminate and almost cuspidate rather than obovate-obtuse.

On Mt. Sheldon var. *yukonense* fruited abundantly the first week of August. The achenes, as in *H. gracile,* are dark, wine-red drying almost black.

'NORTH-WEST PASSAGE' PLANTS IN THE SCOTT POLAR RESEARCH INSTITUTE [1]

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ALTHOUGH VEGETATION tends to be less prolific in the Arctic than in most other regions of the world, it is nevertheless virtually omnipresent in one form or another. Not only does it temper the summer landscape and exist in various forms abundantly in the sea, but it also shows characteristic development in fresh water and, in some circumstances, on snow or even ice. Moreover it is upon the photosynthetic activity of green plants, which alone among living organisms can regularly build up simple inorganic substances to complex food materials, that all other forms of life are ultimately dependent for their nutriment and very existence. Consequently the elucidation of botanical problems looms large in many arctic research programmes today, and already more than a century and a quarter ago was occupying considerable attention. Outstanding among earlier investigators were Sir W. E. Parry and his officers who collected plants industriously during his three 'North-west Passage' expeditions (1819-20, 1821-23, 1824-25). The approximate routes of these

[1]) Received for publication December 16, 1948.

voyages, together with the earlier one of Sir John Ross on which Parry also served, are shown on the accompanying sketch-map (Fig. 1). Many of the resultant collections, which are now scattered in various institutions, have recently been studied (1, 2, 3, 4, 5, 6, 7).

The main subject of this present note is the attractive series of such collections which belong to the Scott Polar Research Institute, Cambridge, and which I have been enabled to study through the kindness particularly of Professor Frank Debenham, Dr. B. B. Roberts, and the Rt. Rev. W. L. S. Fleming. Largely because they do not appear to have been considered by Hooker (8, 9) when preparing his botanical appendices to Parry's accounts of his voyages (10, 11), these collections add not a little to our knowledge of the botany of the regions whence they came; moreover they are of considerable historical interest and, being well preserved, merit some description. This will now be undertaken more or less briefly for each of the six 'sets' (numbered I-VI below) into which the specimens seem naturally to fall.

I

The first set to be described appears to be one of the two most significant belonging to the Institute and was evidently collected during Parry's 'second' expedition (10), most of the specimens coming from *Melville Peninsula* or its adjacent islands. In some respects this set corresponds closely to a larger one recently presented to the University Herbaria, Oxford (6). Thus similar (but not identical) gilt-edged paper is generally used for mounting, the sheetlets being most often cut down to about 18.5 x 11 cm., while the labels are frequently identical in their content — although not as regards the hand that wrote them, for most at least in this Cambridge set appear to have been written by Parry himself. Such 'individual' labelling is usually to be relied upon as regards place and date, and in this set the attempted specific determinations — which are also in the same hand and were probably Parry's own—are usually in accordance with modern conceptions.

The set consists of 28 separate sheetlets of specimens that are well mounted and usually in good preservation, representing 3 species of Algae, 2 species of lichens, 6 species of mosses, 2 liverworts, and 21 species of vascular plants. Most of these are now well known from the localities whence these specimens came (1, 14), the majority having been already reported by Hooker (8); the only really notable exception among the vascular plants is *Poa abbreviata* R. Br. of which there is a specimen labelled "Duke of York Bay, Southampton Island, August 18th, 1821" (place and date correspond perfectly with Parry's narrative (10)). This characteristic high-arctic species was reported from Igloolik by Hooker (8) and is now known from elsewhere in the vicinity of Melville Peninsula (1); but it was not previously recorded (at least in the eastern or central sectors of Canada (12)) from anywhere so far south as Southampton Island, to the known flora of which it may now be added, making a total of 169 species and 23 subsidiary entities so far recorded from that considerable land-mass (13). Another significant specimen is that of *Cerastium alpinum* L., *s.l.*, on the sheetlet of which is written "The Island of Igloolik, July 1822". As Hooker expressly reports August as the month of collection of this species at Igloolik, this specimen would seem to give a further indication that he did not consider the present set when preparing his 'Botanical Appendix' (8). There is also a specimen of the lichen *Alectoria ochroleuca* (Ehrh.) Nyl. from Five Hawser Bay, Melville Peninsula, which appears to constitute a new locality; however, the fact that this almost ubiquitous arctic species is well known from the vicinity makes this specimen significant chiefly as yet another indication that Hooker did not see the set to which it belongs.

It is particularly among the mosses that the few cryptogams in the present set are significant, for they include *Ditrichum flexicaule* (Schwaegr.) Hampe from the new locality of Neerlo Nakto Island, and *Hypnum condensatum* Schimp. (also from Neerlo Nakto) which Mr. James Kucyniak affirms is an addition to the known flora of North America.

It would appear most likely that Parry collected as well as labelled most at least of this set; and indeed on the back of one of the moss sheetlets is written "This little collection of Arctic Mosses and Lichens, was given to my dearest Mother by her Cousin Capt. Edw. William [*sic*] Parry... M. Brodrick". The sheetlets comprising this set are enclosed between two carefully fashioned

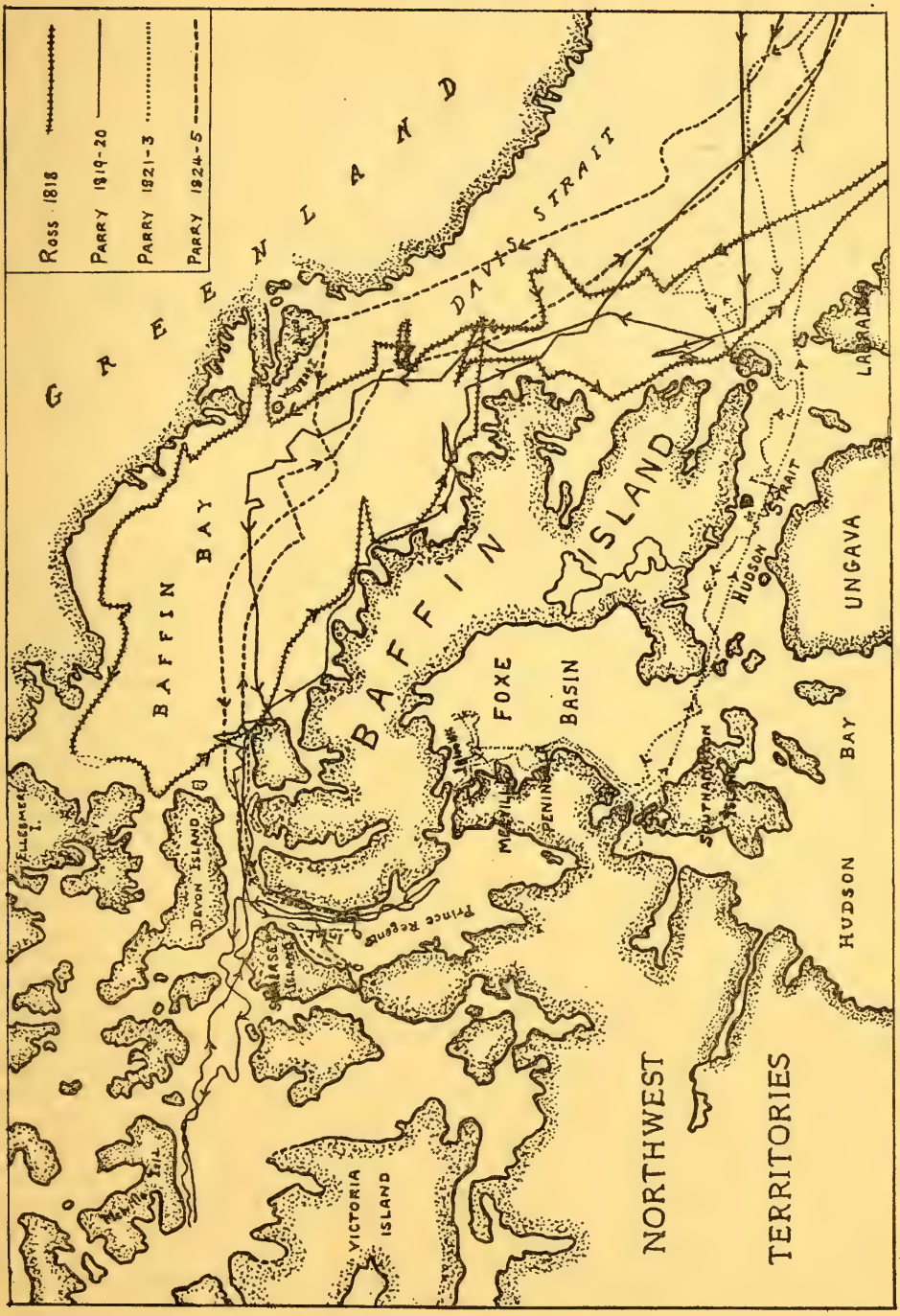

Fig. 1. Sketch-map showing approximate routes of the four "North-west Passage" voyages on which these plants were supposedly collected, viz. Ross 1818 (crossed line), Parry's 'first' 1819-20 (continuous line), Parry's 'second' 1821-3 (dotted line), Parry's 'third' 1824-5 (broken line).

boards of exotic wood that are reminiscent of, but of different origin from, those in the Manchester Museum (5) and in the University Herbaria, Oxford (6). In the present instance the outside of one of the boards bears a small stuck-on paper label on which is written in a hand that may quite likely be Parry's, "Arctic Plants - Captn. Parry 1821-22". To these dates all the enclosed specimens that are dated may be seen to conform; and indeed there is to my mind no reason for not having full confidence in the labels belonging to this set. The only other 'general' label belonging to this set is the name "Louisa Bell" which is written in ink on the board above the stuck-on paper label.

II

Likewise pressed between two beautifully fashioned boards of similar but not identical dark-brown exotic wood is another, much smaller collection of plants. Again stuck on the outside of one of the boards is a small paper label on which is written, in a hand that may well be Parry's, "Arctic Mosses and Lichens — Captn. Parry [?] & 1825". This time the inked name above the label is "Eliza Bell". The earlier date is deleted with black ink which appears to be the same as that in which both "Eliza Bell" and "Louisa Bell" are written, and one can imagine two sisters, having perhaps come by these treasures without realizing their significance, sorting the specimens according to the dates given on the individual sheetlets—although the plant phyla represented, and the general labels referring to "Mosses and Lichens", make one wonder at what period or periods such sorting may have been accomplished. For even if M. Brodrick did not know a moss from a lichen, or these from vascular plants, Parry assuredly did. However this may be, sorting by dates would have involved putting several of the mosses in Louisa's set (where I have treated them), in compensation for which Eliza may have received the earlier specimens (*see* below); for whatever may have been the first, deleted date, it can be plainly seen that it was not 1818.

The present 'set' consists of only 6 sheetlets, though these fall naturally into two categories which will be treated as separate sets. Of these the larger comprises four sheetlets that were evidently gathered during Parry's 'third' expedition (11). They are mounted on rather thick pieces of drawing paper which have been roughly cut down to about 16 x 9 cm. each, and are labelled individually with the locality and year of collection. This labelling is in two apparently contemporary hands, one of which, although not typical, may yet be Parry's. The sheetlets and specimens are reminiscent of some of those belonging to the Manchester Museum (5), and are from Somerset Island and the adjacent northwest coast of Baffin Island. Three are mosses and the other is a flowering specimen of *Dryas integrifolia* M. Vahl, all being known from the Canadian Eastern Arctic (14) although one of the mosses, *Tetraplodon mnioides* (Hedw.) B.S.G. from Somerset Island, is an addition to the known flora of that considerable island, while another, *Bryum pallescens* Schleich. from Port Bowen, has not previously been recorded from northern Baffin.

III

The remaining two sheetlets of the second collection appear (at least according to their labels) to have been obtained during Captain John Ross's earlier "Voyage of Discovery... for the purpose of exploring Baffin's Bay, and inquiring into the probability of a North-West Passage", and consequently comprise another set. On this voyage, Parry served as a lieutenant and had command of the smaller ship (15). There is no indication as to the collector, but unlike the situation with most of the known specimens gathered on Ross's expeditions (1, 16), the locality is given in the present instances, although of the second of the sheetlets the authenticity is perhaps to be doubted.

One of the sheetlets is of *Neuropogon sulphureus* (König) Hellb. and is labelled "Arctic Lichen. Found at the N. E. part of Hare or Waygatt Island, Davis's Straits, Lat. 70° 27' N. June 18th. 1818. Captn. Parry's 1st. Voyage". This specimen may yet be the one, or a duplicate of the one, cited by Robert Brown (17) as "Usnea?—,nov. sp.? absque scutellis". The writing, although not typical, bears a strong resemblance to some forms of Parry's own; nevertheless, the indication of "Captn. Parry's 1st. Voyage" is misleading as the expedition that is usually so termed took place in the years 1819-20 and during its course Hare Island, which lies off the west coast of Greenland, was not visited (18). Nor was Parry prom-

oted even to the rank of Commander until late in 1820. Apart from these items the label checks almost perfectly with Ross's account, for he writes (15) of "Waygatt or Hare Island" that "On the 18th" (of June, 1818) "I went on shore at noon to take the sun's transit... the latitude was determinated to be 70° 26' 17"... Here then we rested... While on shore, parties were occupied collecting specimens of natural history, and in making geological researches".

The other sheetlet that conforms most closely to this one bears four scraps of apparently exotic dicotyledonous plants that seem inadequate for determination. The paper is different from that of the other sheetlets considered above, although apparently identical with that of the majority of the next set considered below; but the label, which is in a different hand from all the rest, reads "Found N.E. part of Hare or Waygatt [*?sic*] Island. Lat. 70° 27' N. This is the only wood and [three illegible words]".

IV

This is the other of the more significant sets and consists of 22 sheetlets of which the majority are of thin but good quality paper that is watermarked "Gilling & Allford 1820" and so folded over as to protect the specimens which are usually mounted with glue instead of the commoner strips. Each sheetlet is labelled in what is clearly Parry's hand, and with the possible exception of three which are unlocalized they were all collected at "Igloolik 1823" and accordingly belong to his 'second' expedition (10). The specimens are all in good preservation and the majority are correctly determined, with the name written over the locality and date by Parry who may also be presumed to have been their collector. They comprise one moss and fourteen different species of dicotyledonous plants, all belonging to widespread arctic species that were already recorded from Igloolik by Hooker (8). However, the date given on one of the sheetlets of *Cerastium alpinum* L., *s.l.*, again makes it seem improbable that Hooker can have seen the present specimens when preparing his 'Botanical Appendix' (cf. above).

The two specimens of scurvy-grass *(Cochlearia officinalis* L., *s.l.*) in this set appear to belong to var. *arctica* (Schlechtend.) Gelert, which has not been recorded from Igloolik; but they are scarcely sufficient for the foundation of a new record of a 'critical' entity which in any case is already known from the nearby Neerlo Nakto Island (1).

V

It is greatly to be regretted that the two remaining sets are unlocalized and indeed virtually unlabelled — the more so as they are the largest of all. Consequently we cannot use them for citation purposes. To be sure, one of them is accompanied by a recent note on the paper of the Institute which states that they are "Plants Collected by Lieutenant J. Nias during the Parry Expeditions. 1819-1822", and I also have a statement initialled by Dr B. B. Roberts to the effect that "A label with this collection reads as follows: 'Given to Jane Sheppard Alison by Lieut. Joseph Nias who sailed with Capt. Parry on board the [name omitted] to endeavour to discover the Northwest Passage'. Presented by Mrs. Baynes and Miss C. Nias". Actually, Joseph Nias was a midshipman on board the *Hecla* on Parry's 'first' voyage and a lieutenant on the *Fury* during Parry's 'second' voyage; and as the 'first' voyage took place in 1819-20 and the 'second' during 1821-23, it may well be that the above dates are correct even if at first glance they appear incongruous. Indeed this would seem the more likely because the present set contains a specimen of *Geum rossii* (R. Br.) Sér., which was first described as *Sieversia rossii* by Robert Brown from material collected on Melville Island during Parry's 'first' expedition, but which is unknown from the region visited by the 'second' expedition (19), whereas this set also contains specimens of *Matricaria inodora* var. *nana* (Hook.) Torrey and Gray emend. Polunin which was well represented in the collections brought back from the 'second' voyage (1, 8) but is unknown on Melville Island where all the plants brought back from the 'first' voyage are *supposed* (3) to have been collected. However this may be, the present set, being unlocalized, is practically valueless from most points of view—and the more pity as it is large and well preserved, consisting of 22 folders and one extra sheetlet which in most instances contain several (in some as many as 9 or 10) different plants. Almost all the plants belong to widespread and common arctic species. More than half the folders measure about

20 x 14 cm. and are made of larger pieces of the same paper as the last set described above; the remainder are still larger and of different, unwatermarked paper.

VI

The final set comprises an assortment of 7 folders of various sizes and 19 loose sheetlets of plants that are without any label of any kind, although it has been said that they were collected by Nias. From their general appearance the plants might well emanate from Melville Island. The suggestion about their collector may be supported by the fact that both of the main types of paper used in the Nias collection (described last above) are also represented in the present set.

In conclusion, it is a pleasure to thank the officers of the Scott Polar Research Institute for the loan of these interesting collections, and the following gentlemen for specialist determinations: Dr. R. M. Whelden of Harvard University (Algae), Mr. George A. Llano of the Smithsonian Institution, Washington, D.C., (Lichenes), and Mr. James Kucyniak of the Montreal Botanical Garden (Bryophyta, apart from the single *Bryum* which was determined by Prof. A. LeRoy Andrews of Cornell University). Grateful acknowledgment is also due to Mr. Richard Pennington, University Librarian at McGill, for advice and assistance in dealing with problems of calligraphy — particularly in relation to the fine series of Parry letters in the Redpath Library of McGill University.

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NOTES AND OBSERVATIONS

The Steller Eider in British Columbia. — On October 15th, 1948, when Mr. Ronald M. Stewart of Massett, Q.C.I., B.C., was duck hunting on Massett Inlet he noticed a flock of Lesser Scaup which had only recently arrived. These birds appeared tired out and were resting with heads under wings. Amongst these he noticed one which looked strange and this bird he collected. Believing it to be a Steller Eider, Mr. Stewart sent it to the writer for confirmation. The bird proved to be an immature female Steller Eider, *Polysticta stelleri.* The bill shows the characteristic shape of that of the Steller Eider and in general the bird is more lightly coloured than the adult female, the underparts being mottled with definite barring on flanks and lower abdomen. The tertials are straight and the colour of the specilum is not so pronounced as in the adult nor is the lightish ring about the eyes so clearly defined. The bill, before drying, was a light slate grey and the tarsi and feet light brown.

This, apparently, is the first record of the Steller Eider in British Columbia waters. — *KENNETH RACEY,* 6542 Lime St., Vancouver, B.C.

Feeding Flights Of Common Terns Across The Niagara Peninsula. — Although no breeding colonies are known to exist in the western part of Lake Ontario, common terns, *Sterna hirundo* L., are abundant throughout the summer along the shore of western Lincoln County. From May to late July many can be seen almost any day, leaving Lake Ontario and heading south or southwest across the Niagara Peninsula toward Lake Erie, or arriving from that direction. Early in June they become more noticeable and the majority of those going south carry fish in their bills. They are frequently heard passing over long after dark.

The source of these terns appears to be Mohawk Island, a small island in Lake Erie about three miles east of Port Maitland and somewhat over a mile off the shore of Haldimand County. On June 13, 1948, great numbers of terns could be seen through binoculars from the mainland, flying about and alighting on the island, and many others were scattered over the surrounding waters. A large proportion of those flying toward the island carried fish. Although the island was not visited it was evident that it supported a populous colony. It has since been learned, from a note by Donald Gamble (Prothonotary 14 (7): 46-47, 1948) that this is an old and well-known colony which contained about 1100 nests in 1948.

During twenty minutes of observation about 3.00 p.m., seven terns arrived at the

Erie shore from the north, from the direction of Lake Ontario, all bearing fish, and flew on toward the island, and as the writer drove eastward along the shore road near Lowbanks, others reached the lake from the north and then turned westward in the direction of the island. The shortest airline distance from Mohawk Island to Lake Ontario is twenty-five miles; the round trip therefore requires a flight of at least fifty miles, and as they frequent a long stretch of the Ontario shore many must travel seventy-five miles or more.

A possible clue to the cause of these long flights was noticed on May 16, 1941. Several terns among a party of about forty were displaying on the pier at the Horticultural Experiment Station at Vineland Station, some, presumably males, presenting fish to others with much posturing. When the flock was startled a couple of fish left on the pier were found to be gaspereau or alewife *Pomolobus pseudo-harengus* (Wilson). This fish is very abundant in Lake Ontario, where the waters along the southern shore are often covered with dead and dying individuals in June. Most of these are too large to be eaten by terns, but sufficient smaller ones are present to form a very easily obtainable food supply. According to Hubbs and Lagler (Fishes of the Great Lakes Region. Cranbrook Inst. Sci. Bull. 26, 1947.) this species has only recently entered Lake Erie.

Parties of juvenile terns still being fed by their parents sometimes appear along the shore of Lincoln County in August. It would be interesting to know whether they come from the Mohawk Island colony or from breeding grounds in eastern Lake Ontario.

While the writer was at the Erie shore opposite Mohawk Island, three gulls approached from the north and continued toward the island. One was a herring gull *Larus argentatus* Pontopp. but the others were too distant to be identified. According to Gamble there were about nine nests of the herring gull and at least 125 nests of the ring-billed gull *Larus delawarensis* Ord on the island in 1948. Both are very common on Lake Ontario and probably also make feeding flights across the Niagara Peninsula. — WM. L. PUTMAN, Vineland Station, Ont.

Red Crossbills Collected In The Ottawa District. — On January 21, 1948 I set out for Pakenham village hoping to find red crossbills which had been reported there and, if possible, to collect specimens. Miss Verna Ross and Miss Mary Stuart accompanied me. In the Burnt Lands in Carleton County, twenty-two miles from the city of Ottawa, two red crossbills flew down into the road in front of my car.

When I got out the birds left the road to perch in the highest points of the conifers at the roadside. Several males were singing. The birds seemed fairly tame and returned to the roadway several times presumably to get gravel. Two dozen birds were feeding on the cones of the pines and spruces in the vicinity. The majority were red crossbills.

I collected a pair of red crossbills and a male white-winged crossbill for the National Museum of Canada, Ottawa, and an adult male, immature male, and adult female red crossbill for my own collection. The red crossbills collected were Eastern Red Crossbill, *Loxia curvirostra minor.*

On the following day Mr. Hoyes Lloyd visited the same spot with me and collected a pair of white-winged crossbills. No red crossbills were observed.

A week later, January 29, Dr. Oliver Hewitt and I again visited the Burnt Lands. We saw one pair of red crossbills on the road, either getting salt or gravel. They flew into a tree by the roadside where the male sang for five minutes. Both then flew into the thick bush. We searched the woods but were unable to find the birds again, either then or on subsequent visits to the Burnt Lands. — A. E. BOURGUIGNON, Ottawa.

Pintail and Ring-Necked Duck Breeding in the Ottawa Region — Numerous recently published notes indicate that both Pintail *Anas acuta tzitzihoa,* and Ring-necked Duck, *Aythya collaris*, are extending their ranges or re-establishing breeding populations in the eastern provinces and north-eastern states. However, positive breeding records of these species in the east are still worthy of publication.

On May 18, 1948, I flushed a female Pintail from her nest on the edge of MacLaren Lake, a land-locked bay on the north side of the Ottawa River in the Province of Quebec, about 10 miles east of the city of Ottawa. The nest contained seven fresh eggs.

The drake Pintail was still in attendance on the female. On May 20, I found the nest deserted and the contents destroyed, apparently by crows. There was no evidence of re-nesting in that area by the Pintail.

On June 29, 1948, Mr. Rowley W. Frith and I spent two hours in the western part of Lochaber Bay, also on the north side of the Ottawa River, about 30 miles below Ottawa. This shallow bay supports a heavy growth of *Scirpus fluviatilis*. Two female Ring-necked Ducks were seen to behave as though they had broods. Finally one brood of five very small downy young was discovered. On the following day I located three female Ring-necked Ducks with broods of 5, 4 and 8. The cover was so dense that some of the young may have been missed.

On June 3, 1949, I again visited Lochaber Bay in an attempt to locate a nest. Five drake Ring-necked Ducks and six females were seen. Four of the drakes were together in the centre of the marsh, and I believe that four of the females may have been incubating full clutches of eggs. The fifth drake was in attendance on a female at the east end of the marsh. After careful observation of the pair, the shore was searched and a nest with 5 eggs was found on a grassy hummock surrounded by shallow water. The water level was high on June 3, and the water could be expected to recede somewhat before the time of hatching.

While the Ring-necked Duck may have been breeding unobserved in the Ottawa region for some years, its appearance as a breeding bird on Lochaber Bay is recent. It was not found there in 1944 or in 1947, when observations were made in that area. — OLIVER H. HEWITT, Dept. of Conservation, Cornell University, Ithaca, N.Y.

BOOK REVIEW

American Wild Flowers, *by Harold Moldenke, Curator, New York Botanical Garden. D. Van Nostrand Company, Inc., New York and Toronto. 1949, pp. 453, illustrated with 88 photographs in full colour and 67 in gravure. Price, $8.75.*

AMERICAN WILD FLOWERS is the first of a series: *THE NEW ILLUSTRATED NATURALIST* and will be followed by other books on spiders, butterfies, birds and on many other subjects.

The present volume will meet the need for a popular and well-illustrated book on "all" the well-known wild flowers of United States and Canada. Of the 32,000 species of flowering plants said to occur in North America north of Rio Grande, Dr. Moldenke has selected a couple of thousand of the most popular and best known species, varieties and named forms. This number includes not only native plants, but also naturalized exotics. In each of the fifty chapters one or more, not always very closely related families are treated and within each family the best known genera are described and enumerated. Within the genus representative individual species are described together with their distribution. Common as well as scientific names are given. For the former, Dr. Moldenke, to avoid the difficulty of selecting common names from the great diversity of regional vernacular names, has adopted those of "Standardized Plant Names", Edition 1942. This obviously has some advantages but in a number of cases leads to names and combinations that to those not familiar with the "Standardized list" may at first appear somewhat puzzling. A few random samples: Wildallamandas *(Urechites)*, Californiapea (*Lathyrus californicus*), dwarfirises (*Iris* or *Neubeckia)*, or the more obvious, but equally strange: Venuslookingglasses *(Triodanis*—to most botanists known as *Specularia)* and Dogtoothviolet *(Erythronium)*. The photographs are excellent and well chosen and the reproduction good for this type of book although the reproduction of the colour plates is inferior to that in Torsten Lagerberg's: *"VILDA VAXTER I NORDEN"*, which is currently being published in Sweden.

At the end, there is a Select Bibliography and an index to common and technical names. —A. E. PORSILD.

Spiders.—*By T. B. Kurata, Royal Ontario Museum of Zoology, Handbook No. 6, Toronto, Ontario, 1949.*

A number of years ago, the Royal Ontario Museum of Zoology inaugurated a series of handbooks designed to afford the general public a variety of information on various subjects of Natural History. This present work is the latest addition to this series. It contains 33 pages consisting of an account of the salient facts concerning the habits and classification of our native spiders. It is written in a popular style with an obvious attempt to avoid technical phraseology, which is often confusing to the non-professional reader. Nevertheless, it contains a scientifically accurate account of this most interesting animal group. The work is copiously illustrated by line drawings which depict the various types of spiders and their webs. A simple key is included for the identification of the common families, followed by descriptions of the habits of the members of the various families, with frequent reference to species most commonly encountered. The bulletin concludes with a brief account of methods employed in collecting and preserving spiders. This should be of special interest to field naturalists.—T. N. FREEMAN.

Birds of Arctic Alaska. — *By Alfred M. Bailey. Popular Series No. 8, Colorado Museum of Natural History, pp. 1-317, 1948.*

This is the long awaited account of the results of Bailey's work on birds of northern Alaska. The area covered, the coastal strip from the Yukon boundary to Cape Prince of Wales on Bering Strait is of particular interest to bird students. Point Barrow is well known ornithologically for the long series of unusual records made by Charles Brower, whose photograph appears as the frontispiece of this volume. It is here at Barrow that such unusual records for the Arctic as western and scarlet tanagers have been made. The list of Old World species which are known in America from the western part of Alaska is surprisingly long. Bailey lists 22 species of rare occurrence including such things as red-throated pipit, wryneck and Siberian cuckoo. In addition there are Old World species with a firm foothold in Alaska, such as Kennicott's willow warbler and the yellow wagtail. The continents are only 50 miles apart at Cape Prince of Wales, and possibly there were habitat differences in glacial times which contributed to the overlapping of the faunas.

The migration in the Bering Strait area is fascinating. Three distinct migration routes cross in the Wales region; some New World species which cross to the Old World side and fly up and down Siberian coast; some Old World birds which come up the Siberian coast and then touch at the Wales area; and the water birds which move north through the straits. Many small birds may not reach the Arctic coast by way of the strait, but cross through low passes in the Endicott Mountains. Shore birds do not arrive in flocks, but appear overnight, apparently already mated.

The account is based on Bailey's work in 1921-22 for the Colorado Museum of Natural History, but all the records from the literature and others from various museum collections have been added. There is a pleasing account of the winter Bailey spent on the coast; and an account of the vegetation, written by Joseph Ewan. The main part of the book (pp. 132-304) is the list of birds, with their occurrence, status and the field observations. The conclusions of a field observer carry weight in taxonomic problems; the Pacific loon and the green-throated loon are kept as separate species, because they both breed in the Wales area; the Canada goose group is considered as forming a single species; several of the many brants seen are considered as *B. b. hrota,* but not typical, being intergrates toward the black brant, *B.b. nigricans.*

The notes on the habits of many species seldom watched by a student on their nesting grounds include such species as the yellow-billed loon, whistling swan, emperor goose and ptarmigan.

Naturally a reviewer is never satisfied; one would have wished for a better map, and fuller discussion of the fauna from general biological and distributional viewpoints. But Bailey is to be congratulated on a volume which is indispensable to anyone working on the birds of northwestern North America. — *A. L. RAND.*

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Canadian Field-Naturalist

Vol. 38,	No. 1,	Jan.,	1924
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Published by the
OTTAWA FIELD-NATURALISTS' CLUB
Entered at the Post Office at Ottawa, Ont., as second class matter

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The Canadian Field-Naturalist

Vol. 64 OTTAWA, CANADA, MARCH-APRIL, 1950 No. 2

NOTES ON THE BIRDS OF THE UNGAVA BAY DISTRICT [1]

HENRY HILDEBRAND

School of Fisheries, University of Washington, Seattle, Wash.

DURING 1947 and 1948 the writer made three trips to Ungava Bay under the sponsorship of the Canadian Fisheries Research Board. On two summer trips lasting from June 14 to September 8, 1947 and June 17 to October 5, 1948 respectively, the writer was a member of a marine biological survey under the directorship of Dr. Max Dunbar of McGill University. One late winter trip, which lasted from March 21 to April 17, 1948, was undertaken by the writer to investigate under-ice fishing on lakes in the Fort Chimo area. Bird observations were limited on these trips due to the press of other duties, and were necessarily confined to the immediate coastal region and the trading posts in that area.

The itinerary of the three trips was briefly as follows: June 14, 1947, arrival at Fort Chimo; June 23, 24 False River and return; June 28 to July 20 hydrographic investigations along the west coast from Chimo to Payne Bay and return with stopovers at Kasigiaksiovik on the south shore of Leaf Bay from July 1 to 10, and at small uncharted islands near the entrance of Hopes Advance Bay from July 12 to 14; July 21 to August 4, Fort Chimo and Koksoak Estuary; August 5, 6 Fort Chimo to George River; August 7 to 11 George River to Keglo Bay and return; August 16 to 26 George River to Port Burwell and return with a stopover at Port Burwell from August 10 to 25; August 27 to 31 George River to Fort Chimo; September 8 departed Fort Chimo; in 1948 March 21 to April 17 under-ice fishing on the following lakes in the vicinity of Fort Chimo, Lake Mendry, Lac Berthet and Lake Stewart; June 17, 1948, arrival Fort Chimo; June 30 to July 14 sealing along the edge of floe ice from Inukshuktuyak to False River; July 14 to 18 sealing east north-east of the Gyrfalcon Islands; July 24, 25 Fort Chimo to George River; July 26 to August 19 George River to Port Burwell and return with a stopover at Port Burwell from July 29 to August 18; August 19 to 31 George River Hudson's Bay Post; September 1 to 2 George River to Fort Chimo; September 2 to October 5 Fort Chimo.

A small collection of 173 bird skins was made and they, together with observations on the species represented, form the basis of this report. All skins collected are deposited in the National Museum of Canada in Ottawa.

A complete review of the literature on the birds of this region was not undertaken. The largest collection from this district was made by Lucien M. Turner, who was sent to the region by the United States Army Signal Service and the Smithsonian Institution during the years 1882-4. He made a large collection in the Fort Chimo neighborhood. An interesting sidelight is that the writer found an old native, Tommy Gordon, who remembered Turner's sojourn in that region very well.

The writer wishes to acknowledge his indebtedness to the following: Mr. W. Earl Godfrey of the National Museum in Ottawa, who verified all identifications and critically read the manuscript; Dr. Max Dunbar of McGill University, who aided in making the collection; my colleague Philip Orkin who assisted in making the collection in 1948; and Lewis McI. Terrill of Montreal who aided in identifications. I also wish to express my indebtedness to the Hudson's Bay people, Bob May and Mr. and Mrs. P. M. Wright; the Anglican Missionary, Rev. Arnold Ruskell; and the R.C.M.P. representative, Constable Kenneth McLean, without whose help and hospitality this work could not have been accomplished. A special debt is owed the Suppa family, Eskimos, who worked with and aided both summer parties.

Ungava Bay is the large bight on the south shore of Hudson Strait and is located between roughly 58° to 60° North latitude, and 65° to 70° West longitude. Many of the features of this bay are at present unnamed; conse-

[1] Received for publication May 9, 1949

Vol. 64, No. 1, January-February, 1950, was issued February 18, 1950.

quently a few of the names which I have used are not on any existing map, but are the native names of the areas in question. The coastline on all existing maps is at error at several places both on the east and west coast, particularly the areas of Keglo Bay and Hopes Advance Bay. Akpatok, a large and conspicuous island at the northern entrance of the bay, was not visited. It is known to be a nesting place for murres from which its Eskimo name is derived. The west coast north of Payne Bay was not visited. Numerous rivers drain into the bay, the largest of which is the Koksoak River in the southwest part of the bay. Other major rivers are the George and Payne Rivers, which like the Koksoak, have a Hudson Bay Trading Post located on their shores. Whale and Leaf River formerly had trading posts, but these are now abandoned. Lesser rivers draining into the bay include the Mukalik, False, Tunulik, Tuktuk, and Korok Rivers.

The coast line actually traversed by the hydrographic survey stretches from northern Killinek Island on the east coast to Payne Bay on the west. At no point does the tree line reach the coast. The population of the coast traversed is entirely Eskimos, and although the people are for the most part nomadic, the census figures are based on their trading centers. George River has approximately 187 natives, with 30 residing at Port Burwell; Fort Chimo on the Koksoak has 257 Eskimos plus an additional 200 Indians from inland; and Payne Bay has approximately 350 Eskimos.

The region may be roughly divided into bush, barrens or tundra, and marine. None of these habitats was investigated thoroughly due to the work being confined to the shore region and the neighborhood of the trading posts.

I have used the term 'bush' rather than 'forest' due to the small size of the trees in the region studied, and to indicate the abundant undergrowth of alders, willow, and dwarf birch in places. The term 'bush' is not meant to include areas of willow growth north of the tree line. Vegetation varies considerably within this region from the swampy sedge and sphagnum moss communities to the rocky hills where only lichens find ecesis. Principal trees, are the larch, *Larix laricina* and black spruce, *Picea mariana*, and in a few favored sites poplars, *Populus* sp. Collecting was done at two separate sites within the bush region near the trading posts at Fort Chimo and George River.

Fort Chimo, which is located on the Koksoak River approximately twenty-five miles from its mouth and ten miles from the tree line, was chosen as the base of operations because of its proximity to an established airfield. This district is a part of the Canadian Shield and shows plainly the effects of glaciation. Much of the country is barren gneissic ridges covered sparingly with lichens and mosses. The region is pockmarked with numerous lakes and ponds. Drainage is poor and most of the valleys are swampy, but the depth of soil or peat is limited to a shallow layer. Glacial erratics and moraines of glacial till are much in evidence. The trading post at Fort Chimo rests on a terrace composed of glacial till along the Koksoak. The tide is still felt at Fort Chimo, high spring tides of 25 feet expose large areas of sandy, rocky flats. Bird habitats at Fort Chimo have been considerably altered due to the extensive cutting of black spruce for firewood and flooring boughs by the natives.

George River, Hudson's Bay Trading Post, is located in the southeast part of the bay. Its relationship to the tree line is approximately the same as Fort Chimo. One of the most characteristic differences is in topography. While Fort Chimo is generally flat with a few low hills, many hills are present in the George River neighborhood, three of which, in the immediate vicinity of George River Trading Post, are approximately 800 or more feet in height. This leads to much admixture of purely barren land condition on the hills to timbered sections in the valleys. Very impressive is the much more luxuriant vegetation in the protected valleys, and there is much less disturbance of the natural environment due to tree cutting than at Fort Chimo. Two trees enter the vicinity of the trading post which are apparently absent along the Koksoak. These are the white spruce, and a short distance inland on the river, paper birch. Kopaluk, a lake and a stream with a heavy stand of spruce two miles up the river from the post, was visited twice during August, 1948.

The barrens include the tundra region which skirts the bay. This is a low rocky region on the west but along the east shore the topography is much more rugged. Numerous little lakes and ponds dot the region. Vegetation consists of mosses, sedges, grasses, and flowering herbs. Willow and dwarf birch grow in favored sites well protected from the wind. A number of sites were visited along

the east and west coast, but only briefly and often with no collecting being done. Principal collecting stations were Inukshuktuyak at the mouth of the Koksoak River, Kasigiaksiovik on the south shore of Leaf Bay, and Killinek Island at Port Burwell.

Inukshuktuyak is located on the west side of the mouth of the Koksoak and is a typical barren land region as described above. This spot was interesting due to the large numbers of nesting birds, proximity to tree line, and as a migratory route. The Nepihjee River forms the west boundary to this point, and was followed inland to the tree line approximately four miles from the coast. The river bank is marked by an abundant growth of willows and on the drier adjacent region by dwarf birch. A few stunted, shrubby black spruces were the only kind of trees along the timberline. The limit of the larch was not determined, but in this particular region it was south of the spruce. A large muddy tidal flat at the mouth of the Nepihjee is a favored spot for large flocks of semipalmated plovers and sandpipers.

Kasigiaksiovik is the native name for a river and district on the south shore of Leaf Bay. This name does not appear on any map of the region. Kasigiaksiovik is a small fast stream draining Ballantyne Lake. The lower part of the stream drains through a sandy meadow. Along the south shore of Leaf Bay are raised beaches, approximately 100 feet in height. The permanent frost zone was found to be eight inches below the surface on July 8, 1947.

The coast from Leaf Bay north to Payne Bay was not visited. A stopover was made at some small uncharted rocky islands off the entrance of Hopes Advance Bay. The vegetation is very limited and is mostly lichens, mosses, grasses, and a few small flowering herbs. No mammals were seen, and it is doubtful if any but an occasional seal visit the islands during the summer months. These islands were nesting sites for Arctic terns, eider ducks and guillemots.

False River includes a large estuary which resembles the mouth of the Koksoak. All collecting was done on this estuary.

Keglo Bay is typical of the hilly east coast. Many islands, tidal and otherwise dot this region. Small marshy ponds make this an ideal nesting place for loons.

Port Burwell is located on the southwest part of Killinek Island. Killinek is a bleak and forbidding chunk of rock with only a limited growth of plants. Many steep and rocky cliffs and ravines with small ponds characterize the island. Port Burwell has a mean summer temperature which is reputed to be 15° lower than Fort Chimo due in part to the fogs which roll in from the Atlantic. Marine fauna is much richer than in the western part of the bay due to the entrance of Atlantic water. The Atlantic cod, *Gadus callarias,* is the main indicator of this difference in fish fauna.

Marine is included to describe the conditions in the bay. Ungava Bay is noted for its high tides, which measure 38 feet or more on spring tides at the mouth of the Koksoak. These tides expose large areas of tidal flats which vary from mud to glacial boulders and sand or bare rock. Ice conditions in the bay during the summer depend upon the direction of the winds, a northeast wind will prevent the floe ice from reaching the Atlantic. Navigation into the bay normally does not start before the last week in July and may be slightly earlier or later depending upon the winds. Natives start sealing operations by peterhead boat shortly after the break-up of ice on the rivers, but native boats are rarely able to make the trip between Payne Bay and Fort Chimo before the middle of July. During the winter a large part of the bay is closely packed floe ice, and all navigation into the bay is usually completed by the first week in October. Open water is found at the mouth of the George and the Koksoak River the entire winter. A part of the turbulent McLelan Strait which severs Killinek from the mainland is open all winter, and supports, according to the natives, a much richer winter bird fauna than the open water at the mouth of the Koksoak.

Climate is generally variable, temperatures of *ca.*—45° to 95° F. have been recorded. Frost may occur during any month of the year as may light snow flurries. Break-up on the Koksoak River occurs about the first week in June, and on the Leaf and Payne River usually a week to ten days later. The larger lakes at Fort Chimo are usually not free of ice until the first week of July. The larch, *Larix laricina,* usually leafs out around the fifteenth of June and the leaves turn yellow about mid-september. Immense swarms of mosquitoes and blackflies are usually present during the months of July and August only. The time of snow cover varies however, but usually extends from the first of November to the middle of May. Snow cover is approx-

imately a meter deep within the tree line. The year 1948 was noted for a very light snowfall, and also a dry summer with a lowering of lake and river levels.

The following is an account of the species represented in the collection. Sight records, unsupported by specimens, are listed separately at the end of the first list.

1. **Gavia immer immer** (Brünnich).

COMMON LOON.—One specimen was collected five miles north of Adluilluk Fjord on the east coast of Ungava Bay on July 27, 1948. Loons were noted as being especially abundant in the Keglo Bay area on the east coast. Eskimos do not hunt loons, but would not pass up a shot at one of them. No use is made of the loon except as dog food, although in case of food shortage it would be eaten. A skin of this species and one of the red-throated loon was seen in a house at Port Burwell, probably for use as napkins or mops.

2. **Gavia stellata** (Pontoppidan).

RED THROATED LOON.—A red-throated loon was collected on False River on July 3, 1948, which had an almost fully developed egg in the oviduct. This was the most common loon along the coast. Groups of two to four would often be found feeding among the ice floes in the lower bay during July 1948. This species was common at Kasigiaksiovik and also Port Burwell.

3. **Fulmarus glacialis glacialis** (Linnaeus).

ATLANTIC FULMAR. — A fulmar was taken on August 3, 1948, about two miles west of Port Burwell. Flocks of three to eight were often seen during our stay at Port Burwell during both 1947 and 1948. This bird is unknown to the natives in the southern part of the bay, and we obtained no sight records south of Killinek Island.

4. **Branta canadensis** subsp.

CANADA GOOSE.—One downy young from a nest of three was collected July 3, 1948, at False River. One of the best nesting places for geese is the False River area. A single pair of geese was found nesting on a small island in the Kasigiaksiovik River. The nest contained four eggs, and except for one of the northern eider, it was the only nest on the island.

Geese are much valued by the natives as food and much hunting is done during the nesting season, but I doubt that the Eskimos obtain many as most of the geese nest inland away from the coast. I spent the entire summer of 1948 with 6 Eskimo hunters and they killed only 3 geese.

Flocks of geese were not uncommon along the Koksoak at Fort Chimo during late September, 1948.

5. **Anas acuta tzitzihoa** Vieillot.

AMERICAN PINTAIL, UVUGUK. — One female was collected July 3, 1948, by Simeone Suppa on False River. This was the only bird of that species seen at False River. On July 15, 1948, our Eskimo crew obtained 15 male pintail ducks on an island six miles north of the Koksoak Estuary. The ducks were all moulting. The only other record of pintails were two shot at the trading post on George River late in August.

6. **Clangula hyemalis** (Linnaeus).

OLD-SQUAW.—One old-squaw duck taken at Kasigiaksiovik on July 1, 1947, was preserved. Next to the northern eider this is the most common duck in the coastal region, and was found to be very common in the southern and western part of the bay. None was observed on Killinek. A nest containing 8 eggs was discovered by George Johannes on June 29, 1947, on the coast two miles south of Pauktorvik Island.

7. **Somateria mollissima borealis** (Brehm).

NORTHERN EIDER, METERK. — One of the most characteristic birds of the Ungava coast is the meterk. It was observed everywhere in abundance except the north and west coast of Killinek Island. Only two specimens of this very common duck were collected, one an adult female at Kasigiaksiovik on July 9, 1947, and the other a downy young collected on a small island in the False River Estutary, on July 3, 1948.

On July 7, 1947, Dr. Dunbar and I followed the Kasigiaksiovik River inland for approximately five miles. In the bend of the stream was a group of islands and small islets around which a large flock of female eiders was observed. All the male eiders had left the vicinity except for two which were observed on the river. On July 9, 1947, I returned to the locality with hip boots in order to wade out to the islands. The main groups of islets were surrounded by two channels of cold swift-flowing water and the water braided its way between the islands in a shallow foot-deep layer. The two main channels were about three to four feet deep, but very narrow. However, the swiftness of the stream made it seem unlikely that any predatory mammals could reach the islands. On a large

island was located one Canada goose nest and one eider nest at the edge of a large rock. Near this large island were numerous small islets or hummocks through which the stream wended its shallow way. The largest islet was approximately 10 x 5 feet and the smallest a mere hummock of land. The largest islet had nine eider duck nests and one herring gull nest. Another islet about 9 x 3 feet had three eider nests neatly arranged in a row each about two feet apart. The nests were formed by scratching a slight hollow into the grassy turf and filling it with down. In all, 35 nests were observed on these small islets, 7 nests had 5 eggs, 19 had 4 eggs, 7 had 3 eggs, and two nests had 2 eggs. Incubation was advanced. The female eiders left their nests very reluctantly, and either feigned injury to lead one away from the nest or flew off and circled back to the immediate neighborhood of the nest and would thus have been easy targets for a rifle. These habits are used to advantage by the natives in hunting eider.

Characteristically, the northern eider nests on most of the small islets off the coast of Ungava Bay. Eider nests on the islands near the entrance of Hopes Advance Bay were visited on July 14, 1947. Eiders were nesting here together with large numbers of arctic terns and a few guillemots. Natives had collected most of the eggs, but I discovered three relatively well-concealed nests with 5, 4, and 2 eggs respectively.

False River was visited on July 3, 1948, with a sealing party of Eskimos. One small island within the tidal zone contained a number of moulting black ducks, *Anas rubripes*. The natives shot a number of black ducks and one female eider. Two downy young eider ducks, one of which was collected, were observed in a pond on the island.

Gyrfalcon Islands were visited on July 15, 1948. Approximately a dozen eider nests were seen on one island. One nest was observed with the young ducks just hatching. The habits of these female eiders were noted as being wilder than usual as they left the area when frightened from their nests. Our native crew obtained only one. Eiders were noted as nesting on some of the Gyrfalcon Islands with colonies of herring gulls. An eider duck with three young was seen in the water among the Gyrfalcon Islands, and although the female was an easy mark, one of the older natives prevented a young Eskimo boy from shooting the mother bird, the only unprompted act of conservation I have seen among these people.

Available information would indicate that eider ducks nest almost a week to two weeks earlier in the southern part of the bay than they do on the Gyrfalcon Islands and farther north. This is consistent with the fact that break-up and the clearing of the ice away from the coast is usually a week to two weeks later. Most of the eider nesting places observed were on small islands which supported no small mammals, such as lemmings and voles.

The northern eider is of great economic importance to the native population in this region. They eat the eggs in almost any stage of incubation, and value the flesh highly. As a source of food, the eider is the most valuable bird during the summer, and its place is taken in late fall and winter by the ptarmigan. Among a people whose diet is hardly of subsistance level due to the decrease of large game in the region, the importance of this bird cannot be overlooked. There is no commercial gathering of eider down in the region but the natives gather down for their own use.

A survey should be undertaken as to numbers and the best methods of game management in the area concerned. Killing the female with the eggs can lead only to a serious decline in numbers. A supervised game management might lead to an authorized development among the natives of the gathering of eider down by approved methods for commercial purposes. This additional income might lead to a reduction in pressure on the eider population due to an ability to buy more food. White people, Hudson's Bay Company employees in the region, state that the eider is in no danger in the area, that Eskimos have hunted them from time immemorial without a noticeable decrease in population, chiefly because there are large nesting areas which the natives never visit. This is unlikely to continue in Ungava Bay with the coming of power boats. That all may not be well is indicated by my trip to the False River area in 1948, for in many places where the natives said nesting eiders would be numerous few or none were seen. However, on the other side of the ledger travel along the east and southeast coast of Ungava Bay indicated a fairly large hatch of young eiders in 1948.

That Eskimos will take to conservation when they realize it is in their interest to do so is indicated by information given me by Tom Crawford, Hudson's Bay Factor at Payne Bay. The Eskimos at Repulse Bay on the west side of Hudson Bay annually collect eggs from

the nesting sites of gulls in that area. However, the Eskimos know how many times they may take the eggs without destroying the gulls' chances of reproducing and thus destroying the colony. It seems that such a policy could be introduced in Ungava Bay with regard to the eider duck.

8. **Somateria spectabilis** (Linnaeus).

KING EIDER.—A first-year male was taken near the mouth of the Koksoak from a flock of four feeding among the ice floes on July 1, 1948. This specimen had been feeding on large isopods. Other adults killed in the False River area were seen by me. This species is not nearly so common as the preceding one, but is definitely not a rare bird in the area. I have positive records only from the southern part of the bay, but it probably occurs throughout.

9. **Mergus serrator** Linnaeus.

RED-BREASTED MERGANSER.—A merganser thought to belong to this species was seen at Kasigiaksiovik. This is not a common bird along the coast but is reported to be common inland by the natives. The only specimen of this bird that I saw was collected by the Duncan Hodgson-Bob May party on the George River during September, 1948.

10. **Falco columbarius columbarius** Linnaeus.

EASTERN PIGEON HAWK.—One doubtful sight record made of a small falcon at George River trading post during August, 1948. One specimen of this species was collected by the Duncan Hodgson—Bob May party *ca.* 100 miles up the George River, and is now deposited in the Redpath Museum at McGill University together with the merganser specimens mentioned above.

11. **Canachites canadensis canadensis** (Linnaeus).

HUDSONIAN SPRUCE GROUSE.—A resident of the region; two specimens were taken, one at Fort Chimo and the other at Kopaluk on the George River. This species is not common near the timberline, but a short distance inland it increases numerically. Bob May told the writer in 1948, that when he first came to George River about five years ago this species was at the peak of its cycle. Adults and young were extremely abundant up river from the post and could be easily snared.

12. **Lagopus lagopus ungavus** Riley.

UNGAVA PTARMIGAN.—Willow ptarmigan were collected at Fort Chimo, Kasigiaksiovik and False River. This is one of the most common residents of the region. A fair estimate of number is difficult to obtain during the summer as they nest inland away from the settlements and the coast. In 1947 a pair of willow ptarmigan were taken along the Kasigiaksiovik River in an area almost devoid of brush; willow and dwarf birch were very small even in protected localities. The only other ptarmigan observed during 1947 was a pair of rock ptarmigan which were taken at Kasigiaksiovik. During March and April, 1948, willow ptarmigan were seen around the north end of Lake Mendry and Lac Berthet in a heavy growth of willows. Ptarmigan were wild and difficult to approach, however during April the majority of the natives were living on them. During the summer of 1948, birds were obtained at Fort Chimo, Inukshuktuyak, and False River. At False River ptarmigan were found in pairs in small ravines with light willow growth.

The year 1948 was an extremely favorable nesting year and during the latter part of September great numbers of ptarmigan were seen in the spruce and willow shrubbery northeast of Fort Chimo. I estimated that in an hours walk, I saw over a thousand. Flocks of thirty or more would whir over the trading post nearly every day.

Ptarmigan is a very important part of the diet of the Eskimos during its cycle of abundance. A very easy bird to hunt, I know of three instances where single Eskimo hunters killed 50, 32, and 23 birds in a couple of hours of hunting. Sometimes a hunter could shoot into a flock less than twenty feet away without the birds taking wing. The Indians are as dependent as the Eskimos on ptarmigan and probably obtain many more as their hunting ground is inland. I would consider 600 a conservative estimate of the ptarmigan killed in the vicinity of Fort Chimo during September, 1948. However, this large kill should not be viewed with alarm, because the birds are almost untouched on their nesting grounds, and vast areas of the country are never hunted.

13. **Lagopus mutus rupestris** (Gmelin).

ROCK PTARMIGAN.—A common resident of the region. Specimens were taken at Kasigiaksiovik and False River. The pair taken at False River on July 3, 1948, was evidently a non-breeding pair as they were taken late in the evening, when roosting in a willow copse. One downy chick was taken on July 4, 1948, by Simeone Suppa.

One finds it difficult to compare the abundance of the two species. At False River, four small ravines with willow growth were visited, three contained pairs of willow ptarmigan, the fourth rock ptarmigan. At Lac Berthet during April, 1948, willow ptarmigan were noted as being abundant in the heavy willow growth along the streams, while in an adjacent barren area with numerous glacial erratics, a large flock of rock ptarmigan were observed. The rock and willow ptarmigan are easily distinguishable in the field in winter plumage.

Eskimos utilize this species for food to a large extent, but at Fort Chimo the majority of the ptarmigan killed were willow ptarmigan. Women as well as men take part in hunting them.

14. Charadrius hiaticula semipalmata Bonaparte.

SEMIPALMATED PLOVER. — Extremely common, often in large flocks on the muddy tidal flats of the bay. Specimens were collected at Inukshuktuyak and False River. A fledgling was taken on July 31, 1947, at Inukshuktuyak.

This bird was most often seen in company with the semipalmated sandpiper, and great numbers of plovers were seen at Inukshuktuyak, Kasigiaksiovik, False and George Rivers. On the east coast it was not observed north of Keglo Bay, probably due to the absence of mud flats in the area visited. Only an occasional bird was seen on the river flats at Fort Chimo.

15. Pluvialis dominica dominica (Müller).

GOLDEN PLOVER.—Two specimens were taken at Port Burwell, Killinek Island but no others were seen. Simeone Suppa, an Eskimo, stated that these birds were not uncommon at his home on Inukshuktuyak although none were seen there by any member of the hydrographic survey. This bird is extremely unpopular with the natives as they state that it feeds on dog feces. Golden plovers are never eaten by the natives.

16. Actitis macularia (Linnaeus).

SPOTTED SANDPIPER.—Only one specimen of this bird was taken along the Koksoak at low tide on September 5, 1948, about three miles north of Fort Chimo. No other birds belonging to this species were recognized.

17. Erolia melanotos (Vieillot).

PECTORAL SANDPIPER.—Two were collected on a grassy little pond beside the old R.C.M.P. house at Port Burwell, a female on August 10, and a male on August 11, 1948. Several natives were observed throwing rocks at this pair of birds. Although they were frightened off repeatedly, they kept returning. No other birds belonging to this species were recognized.

18. Erolia fuscicollis (Vieillot).

WHITE-RUMPED SANDPIPER. — Three specimens were taken at the mouth of the Koksoak on August 31, 1947. The flock was in migration and the birds were excessively fat. No additional records of this species were obtained.

19. Ereunetes pusillus (Linnaeus).

SEMIPALMATED SANDPIPER. — This is the common breeding sandpiper in the area. Adult specimens were collected at several localities along the coast. A downy was taken along the edge of a pond at Inukshuktuyak on July 8, 1948.

This bird was extremely common at Inukshuktuyak and Kasigiaksiovik. At Kasigiaksiovik, semipalmated sandpipers were found nesting beside small ponds three to four miles from the sea. Nearly every little pond had a pair of sandpipers around it. Two nests were discovered. The nests were hollowed out in the moss near the edge of the pond and contained a few dwarf birch leaves as lining. Each nest contained four eggs, and incubation was only slightly advanced on July 7, 1947. Sandpipers were common on the George River estuary and were recorded as far north as Keglo Bay on the east coast.

20. Lobipes lobatus (Linnaeus).

NORTHERN PHALAROPE.—Adults were collected at False River, Inukshuktuyak and near Pauktorvik Island on the west coast. A very common bird throughout most of the region visited. During the first week of July, 1947, four alighted daily on a small pond in front of our tent at Kasigiaksiovik. The birds were extremely tame and one could approach to the edge of the pond without frightening them. The most conspicuous form of life in the pond were numerous phyllopods.

21. Larus hyperboreus hyperboreus Gunnerus.

GLAUCOUS GULL. — An adult and an immature were collected on a small islet between Bush Island and the northern tip of Killinek Island. The immature bird could fly only short distances when captured on August 4, 1948. Other immatures were caught by hand. No other species of gull were noted

as nesting in the immediate vicinity of Killinek Island. On an island at the entrance of Payne Bay a single pair of glaucous gulls was observed to be nesting with a colony of herring gulls. In all colonies examined in the south part of the bay only herring gulls were recognized.

22. **Larus argentatus smithsonianus** Coues.

HERRING GULL.—Next to the northern eider, the herring gull is the most characteristic of the large birds along the shores of Ungava Bay. It breeds on all suitable rocky islands at least as far north as Payne Bay on the west coast and within fifteen miles of Killinek on the east. Inland this bird nests around many of the lakes and streams.

A nest of this bird was observed on a small islet in the Kasigiaksiovik River together with nine eider duck nests. The young were just picking the shell on July 9, 1947. Gulls nesting on the Gyrfalcon Islands were found to vary in nesting times. On July 14, 1948, young birds were found in the water, one nest with the young just picking the shell, and unhatched eggs.

A young gull on the Gyrfalcon Islands disgorged four young sculpins, *Myoxocephalus scorpius*. This common littoral sculpin along the coasts of Ungava Bay is probably the principal food of the herring gull.

23. **Rissa tridactyla tridactyla** (Linnaeus).

ATLANTIC KITTIWAKE. — Two adults were collected from a flock of about thirty birds, who followed our small boat during plankton hauling west of Killinek Island on August 24, 1947. A native boy shot a single specimen, which appeared around our boat in Burwell Harbor on August 3, 1948. This bird apparently does not nest anywhere in Ungava Bay, although that it may nest on the Button Islands to the north of Killinek Island is indicated by native reports. It apparently does not occur in the southern part of Ungava Bay even during migration as the bird was unknown by our crew, who lived in the southern part of the bay.

24. **Sterna paradisaea** Pontoppidan.

ARCTIC TERN.—A common nesting bird in local areas of the bay. Adults were collected at False River and Tunulik. This bird is extremely common along the southern coast from False River to Tunulik, and certain islands in that region are known to the natives as "tern islands". Another nesting site was small islands near Hopes Advance Bay. No nesting colonies were discovered north of George River on the east coast.

While anchored off some small uncharted islands near the entrance of Hopes Advance Bay, the native crew went ashore to gather eggs. Tern nests were found to be so numerous in the grassy turf that it was difficult to walk without stepping on eggs. One or two eggs were laid in a cavity pressed into the grass. Incubation was slight or none, and although we stayed anchored by the islands from July 12 to 15, 1947, terns flew over the island only once and never alighted on the islands. Northern eider and a few guillemots were also nesting on the island.

Natives prize these eggs despite their small size, and the natives took 116 tern eggs off the small island described above. Tern eggs taken by natives on July 4, 1948, were seen at False River.

25. **Uria lomvia lomvia** (Linnaeus).

BRUNNICH'S MURRE. — Three murres were collected in Leaf Bay. The distribution of this bird in the bay outside its nesting area depends to a large extent on the icing condition in the bay at any particular time. The only nesting place in Ungava Bay is the cliffs of Akpatok Island at the northern entrance. When ice was thick in Leaf Bay this bird was extremely common feeding among the ice floes. However, on the return trip in 1947 when the ice had been blown out into the bay no birds were seen.

Especially noted was the attraction of floating ice to the sea birds in Ungava bay. An isolated berg would usually have several murres and guillemots feeding around the edges. Murres would usually be found feeding close to the floes and not out in the middle of large leads and air holes among the floes. Murres examined were found to be feeding chiefly on amphipods and an unindentified small fish. No use of this bird for food is made by the native population.

26. **Cepphus grylle** subsp.

BLACK GUILLEMOT.—This is the most common resident in the bay and during the winter guillemots are the only birds that occur in the open water near the mouth of the Koksoak and George River. It nests on certain rocky coastal islands where it can hide its eggs under overhanging rocks. Two of the most abundant concentrations of guillemots are Inuksuli, a small island near the Gyrfalcon Islands, and the southeast part of the bay.

Several nests were discovered on the small uncharted islands off the entrance of Hopes Advance Bay. The nests had two to three eggs, and incubation was slight. The natives will gather the eggs, but the birds are left unmolested because of their poor taste. The first white bird observed was a young of the year seen on September 1, 1948, in the south-east part of the bay.

27. **Asio flammeus flammeus** (Pontoppidan).

SHORT-EARED OWL. — One adult specimen was taken at Fort Chimo on September 5, 1948. None was seen in the area previous to that date. After the above date and throughout the remainder of September this species was very common at Fort Chimo and as many as 18 were seen flying over the terrace at dusk. No owls were seen the previous year. This large number of birds might be attributed to the large increase in vole *Microtus pennsylvanicus,* population over that of the previous year.

28. **Eremophila alpestris alpestris** (Linnaeus).

NORTHERN HORNED LARK.—A common nesting bird throughout the region. An adult female collected together with a fledgling two miles south of Pauktorvik Island on June 29, 1947, contained three egg yolks in the oviduct which would indicate two nestings for the year.

This species was seen at all points along the coasts. Along the flat west coast the bird was found to be more common than the pipit. At Port Burwell and along the east coast the situation was reversed.

29. **Perisoreus canadensis nigricapillus** Brooks.

CANADA JAY.—A not uncommon winter resident in the bush region. At Fort Chimo during March and April, two or three of these birds would be seen near every native encampment. A short time after setting up tents in the spruce trees around lakes in the region, Canada jays would appear.

Only three sight records of this species were made during the summer time. Several of these birds were seen at George River during August, 1948, when they came out of the spruce trees to feed on char. Another was seen at Kopaluk on the George River. At Fort Chimo no birds were sighted during 1947 and only one during 1948. The rarity at Fort Chimo is probably due to the extensive cutting of black spruce in that area.

The Eskimos have a superstition that the finding of this bird's nest brings bad luck. This superstition has been commented upon by Turner. Bill Saunders, a native of the region, stated that a number of years ago one of the Adams boys, a family name of a group of Eskimos at Fort Chimo, saw the eggs of the Canada jay and commented upon the fact. That same spring he drowned in the Koksoak in a boat accident. All the natives however do not believe in this superstition. Alex Gordon, another native, stated that he had found a nest with three eggs at Blueberry Creek during April. Blueberry Creek is a small stream about a mile north of Fort Chimo where the post obtains its winter drinking water.

30. **Parus hudsonicus hudsonicus** (Forster).

HUDSONIAN CHICKADEE. — Five adult chickadees were taken in a spruce stand near Lake Mendry and Lac Berthet during March and April, 1948. Although this species was particularly watched for during 1947 none was seen. In 1948, a stand of black spruce was visited three miles south of Fort Chimo, and one was obtained on June 25, 1948. At Kopaluk on the George River it was found to be common in the black spruce which bordered a small rocky stream.

Winter specimens of this species were taken from small flocks, none of which contained more than five birds. A conservative estimate would be only 12 chickadees sighted during a 27-day stay during March and April, 1948.

This bird was never seen on the terrace at Fort Chimo due to the extensive cutting of black spruce in the area.

31. **Turdus migratorius nigrideus** Aldrich and Nutt.

BLACK-BACKED ROBIN.—The robin is one of the more common birds in the bush region. Adults were taken at George River and Fort Chimo. In this region it is one of the wariest of birds and is extremely difficult to approach. The country between Lake Mendry and Fort Chimo is largely barren rock, but wherever little local swamps or streams are formed and trees find ecesis, this bird occurs.

Two nests were seen, one in a spruce tree in the native cemetery at Fort Chimo which contained two young birds and one infertile egg on June 26, 1947. When I returned nearly a month later the young birds had flown. An immature robin taken from a group of two adults in the same vicinity on July 28, 1947, was possibly from this nest. The other nest was observed on the wooden ledge of a ruined

building at Fort Chimo. This nest contained three eggs on July 21, 1947. A few days later the nest was destroyed, possibly by native boys.

32. **Hylocichla minima minima** (Lafresnaye).

GRAY-CHEEKED THRUSH — Two specimens were taken, one at Fort Chimo on July 26, 1947, and the other a juvenile taken at Kopaluk, George River, the latter part of August, 1948. This is not a common bird in the region and is unknown to many of the natives, despite its distinctive call. No additional sight records were obtained, but during August 1947 it was heard calling both at Fort Chimo and George River.

33. **Regulus calendula calendula** (Linnaeus).

EASTERN RUBY-CROWNED KINGLET.—Two kinglets were collected, one at George River Hudson's Bay Post on July 25, 1948, and one at Kopaluk on August 31, 1948. No other kinglets were recognized. This moves the known range of the ruby-crowned kinglet from central Quebec to the limit of trees in the George River area.

34. **Anthus spinoletta rubescens** (Tunstall).

AMERICAN PIPIT. — An extremely common bird throughout the barren ground region along the coast of Ungava Bay. On the east coast this species was found to be extremely common from Keglo Bay to Killinek Island. On Killinek Island it was much more common than the horned lark. This bird was very abundant around the trading post at George River during late August. Large flocks were common at Fort Chimo during mid-September, 1948.

35. **Lanius excubitor borealis** Vieillot.

NORTHERN SHRIKE.—Two shrikes were taken on September 9, 1948, at the Hudson's Bay Post at Fort Chimo. No shrikes were seen previous to this date, and none was seen in 1947. In the remainder of September and until our departure on October 5, 1948, four to five shrikes were seen nearly every day. The shrike is apparently not a winter resident, as inquiries among the natives during March and April did not reveal its presence. John McLean reported a butcher bird as a winter resident in Ungava. However, McLean traveled as far south as Hamilton Inlet. Flocks of red-polls are certainly adequate to support this species during winter months.

36. **Dendroica coronata coronata** (Linnaeus).

MYRTLE WARBLER.—Two myrtle warblers were taken at George River trading post and Kopaluk. Others were seen in spruce habitat at George River. None was taken or sighted at Fort Chimo, which I attributed to the heavy cutting of black spruce in that neighborhood.

37. **Dendroica striata** (Forster).

BLACK-POLL WARBLER. — This is the commonest warbler in the region. Black-poll warblers were very numerous at Fort Chimo during 1947. Adults were collected at Fort Chimo and George River. At Fort Chimo this bird was found abundant on the terrace on which the post is situated in the willow, larch, and dwarf birch association. This warbler was also seen in black spruce habitat.

38. **Wilsonia pusilla pusilla** (Wilson).

WILSON'S WARBLER.—Wilson's warblers were noted in numbers at George River trading post, on August 27, 1947, in the willow thickets near the Hudson's Bay factor's home. None was seen on a previous visit to this locality on August 7 and 12, 1947, and none was seen in 1948 although extensive collecting was done in the region from August 21 to 31, 1948, and it seems highly unlikely that this brightly colored bird would be overlooked. These are the northernmost recorded occurrences of this species east of Hudson's Bay.

39. **Pinicola enucleator leucura** (Müller).

PINE GROSBEAK.—Pine Grosbeaks were reported by Turner (1885) to be common in the Fort Chimo region. No grosbeaks were sighted by me anywhere in the Ungava Bay area. Bob May reported seeing this bird at Kopaluk, but two trips there late in August were unsuccessful. I am indebted to the Duncan Hodgson-Bob May party for two specimens collected 96 miles up the George River on September 13, 1948. Possibly in heavy stands of spruce this bird is still present at Fort Chimo, although spruce cutting has materially altered the habitat in the Fort Chimo neighborhood.

40. **Acanthis flammeus flammeus** (Linnaeus).

COMMON REDPOLL.—Two species of redpolls abound in the Koksoak and George River region of Ungava. The similarity of the two species makes recognition in the field unreliable, however, of ten summer specimens collected at random, 9 proved to be *flammeus* and the other *Acanthis hornemanni exilipes*. This would indicate that *flammeus* is the more common nesting bird.

One fledging was obtained on June 25, 1948, at Fort Chimo. Two other juveniles

were taken along the tree line on the Nepihjee River on July 8, 1948, in a dense growth of willow. Of eight specimens taken in late March and early April, 1948, only one was this species.

41. Acanthis hornemanni exilipes (Coues).

HOARY RED-POLL.—One breeding female of this bird was collected at Fort Chimo on June 19, 1948. In the oviduct was a fully developed egg. Other eggs of this species or the preceding one were brought into camp by the native boys at Fort Chimo on June 19, 1948. One other summer specimen of this bird was taken a mile north of the tree line at Inukshuktuyak in dwarf birch on July 8, 1948.

Enormous flocks of redpolls were seen during March and April of 1948. Seven of eight specimens collected then are *exilipes*. On cold windy days these birds would seek shelter of the more heavily timbered valleys. One flock estimated to contain over a thousand birds was seen in a small protected valley containing spruce and larch about five miles south of Fort Chimo. On quieter and more sunny days these birds fed in the more open areas. These birds were found to be feeding almost altogether on one species of seed belonging to the Ericaceae. Eskimos stated that redpolls were abundant all winter.

Very few redpolls of any species were noted at Fort Chimo from September 10 to 27, 1948. However, on September 27, 1948, large and noisy flocks appeared on the terrace at Fort Chimo. Most of these birds were much lighter in color than the majority of the nesting birds, but a few dark individuals were sighted in the group.

42. Passerculus sandwichensis labradorius Howe.

LABRADOR SAVANNAH SPARROW. — Adult savannah sparrows were taken at Inukshuktuyak, Kasigiaksiovik, Fort Chimo, and George River. On September 5, 1947, two specimens were taken from a large group near Fort Chimo.

A common bird on both sides of the tree line. This bird was especially abundant at Kasigiaksiovik during July, 1947.

43. Junco hyemalis hyemalis (Linnaeus).

SLATE-COLORED JUNCO.—Juncos were seen and taken only at Kopaluk on the George River on August 31, 1948. Three specimens were taken and several others seen at Kopaluk.

44. Spizella arborea arborea (Wilson).

EASTERN TREE SPARROW.—Most common summer resident of the bush area and along the tree line. Several tree sparrows were collected at Inukshuktuyak at least two miles from the nearest spruce trees on the timber line. It was common in the dwarf birch and willows in the region of the tree line. Tree sparrows were abundant at Fort Chimo as late as September 25, 1948.

45 Zonotrichia leucophrys leucophrys (Forster).

WHITE-CROWNED SPARROW. — The white-crowned sparrow was the most conspicuous member of the avian fauna at Fort Chimo. It rivals the redpolls and the tree sparrows in numbers. It was found commonly along the tree line on the Nepihjee River, and two specimens were taken two miles north of the tree line in very scanty willow and dwarf birch growth.

A nest of young birds was found at the tree line on the Nepihjee River on July 8, 1948, Another nest containing five eggs, was discovered at the base of a vertical rock wall two feet in height on June 25, 1948.

46. Passerella iliaca iliaca (Merrem).

EASTERN FOX SPARROW. — Fox sparrows are rare in the region. Five adults were taken at the George River Hudson's Bay post and one at Fort Chimo. Several natives at Fort Chimo stated that this was the first time they had seen this species. Fox sparrows are not familiar to many of the George River natives, although I found it a much more common bird in that area. This is the first record of this species from Fort Chimo. Except for a group of six seen at George River during late August, 1947, this bird was usually seen singly.

47. Calcarius lapponicus lapponicus (Linnaeus).

LAPLAND LONGSPUR.—A very common inhabitant of the barrens, rivaling in abundance other ground birds such as horned larks and pipits, especially at Kasigiaksiovik and Inukshuktuyak. Adult specimens were collected. One fledgling was taken at Inukshuktuyak on July 8, 1948.

48. Plectrophenax nivalis nivalis (Linnaeus).

EASTERN SNOW BUNTING.—A common bird, which was usually seen in pairs throughout most of the barrens during nesting season. At Killinek, flocks of adults and young were seen every day during our stay in 1948. On

rainy days, snow buntings would be seen crouching under the shelter of overhanging rocks. Next to the pipit, snow buntings were the most abundant bird on Killinek Island.

The snow bunting is the first migrant to return in the spring. Native reports were that snow buntings had preceded my arrival at Fort Chimo on March 21, 1948. My first sight record was on April 13, 1948, when they appeared in abundance around the Hudson's Bay post at Fort Chimo. This period was well before the spring thaw, and temperatures as low as 24° below zero were still being recorded at Fort Chimo.

SIGHT RECORDS

The following birds were identified by sight only.

1. **Anas rubripes** Brewster.

BLACK DUCK. — Twenty males of this species were obtained by the natives on a small island in the False River Estuary. The ducks were moulting on July 3, 1948. Especially noted was the amazing ability of these birds to find hiding places on an almost barren island. This duck is considered the best edible duck by the natives, but the numbers obtained do not approach the number of eider ducks.

2. **Buteo lagopus s. johannis** (Gmelin).

AMERICAN ROUGH-LEGGED HAWK.—A not uncommon bird throughout the entire region. Nesting pairs were seldom out of sight on either coast during 1948. The hawk population was greater in 1948 than in 1947. A nest with downy young was observed near Fort Chimo on June 30, 1948.

Eskimos believe that the disturbance of this hawk's nest causes bad weather, especially strong winds. Natives also advised against shooting this bird, claiming, according to my informant, that bad weather would result.

3. **Falco peregrinus anatum** Bonaparte.

DUCK HAWK. — This species was seen at Kasigiaksiovik, Fort Chimo, George River, and Polunin Inlet on the east coast. A not uncommon bird throughout the region.

4. **Stercorarius parasiticus** (Linnaeus).

PARASITIC JAEGER. — A single sight record from near Pauktorvik Island on the west coast on June 29, 1947.

5. **Nyctea scandiaca** (Linnaeus).

SNOWY OWL.—Three snowy owls were observed regularly in the meadow at Kasigiaksiovik during the first week in July, 1947. One was observed in September east of Fort Chimo. No snowy owls were seen in 1948, although the small mammal population had taken a great upswing. However I spent less time ashore in suitable localities in 1948.

6. **Corvus corax principalis** Ridgway.

RAVEN.—A common bird throughout the region, this species nests regularly at George River and Port Burwell. During March and April, 1948, this bird was very common around the airfield at Fort Chimo.

DISCUSSION

A total of 48 species is represented by skins from the region and 6 by sight only. The region represented is diverse and grades from tree growth to tundra. Barren ground conditions extend within the tree line on exposed and elevated areas.

The most common summer residents at Fort Chimo and George River were tree sparrows, *Spizella arborea arborea;* white-crowned sparrows, *Zonotrichia leucophrys leucophrys,* redpolls, *Acanthis* sp.; black-poll warblers, *Dendroica striata;* and robins, *Turdus migratorius nigrideus.* All species taken at Fort Chimo were also taken at George River. However, additional species which were taken at George River but not Fort Chimo, are ruby-crowned kinglets, *Regulus calendula calendula;* juncos, *Junco hyemalis hyemalis,* myrtle warblers, *Dendroica coronata coronata;* and Wilson's warbler, *Wilsonia pusilla pusilla.* One reason for the occurrence of additional species near the George River Post is the non-disturbance of natural habitat due to spruce cutting. Secondly, George River courses through a much more rugged topography than does the Koksoak. This provides better protection and a much more luxuriant vegetation with the introduction of species unknown on the lower Koksoak. Ornithologically the George River valley is practically unknown; reports from Bob May, who has traveled extensively on the river indicate that many birds occur here far north of their known range. Perhaps when the fauna is well known, nearly every species occurring in the valley of the Hamilton River will also be found on the George River.

A visit was made to the tree line on July 8, 1948. In this region only the black spruce, *Picea mariana,* was present. Breeding birds observed were white-crowned sparrows, red-

polls, and tree sparrows. Tree sparrows were the most common bird and would be seen 2 to 3 miles north of the tree line. White-crowned sparrows would be seen only as single individuals north of the tree line. Redpolls, *Acanthis hornemanni exilipes* were seen only once on Inukshuktuyak north of the tree line, this probably being due to the absence of willow growth in the area.

Coastal islands were the nesting places of herring gulls, guillemots, arctic terns, northern eider, and glaucous gulls. Herring gulls, nested in the southern part of the bay, while in the vicinity of Killinek Island only glaucous gulls nested.

Large mud flats along the coast were inhabited chiefly by semipalmated sandpipers and semipalmated plovers.

The common ground birds in the tundra region were lapland longspurs, horned larks, and pipits. In the Killinek area snow buntings replaced longspurs.

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WILLIAM HENRY MOUSLEY
1865-1949

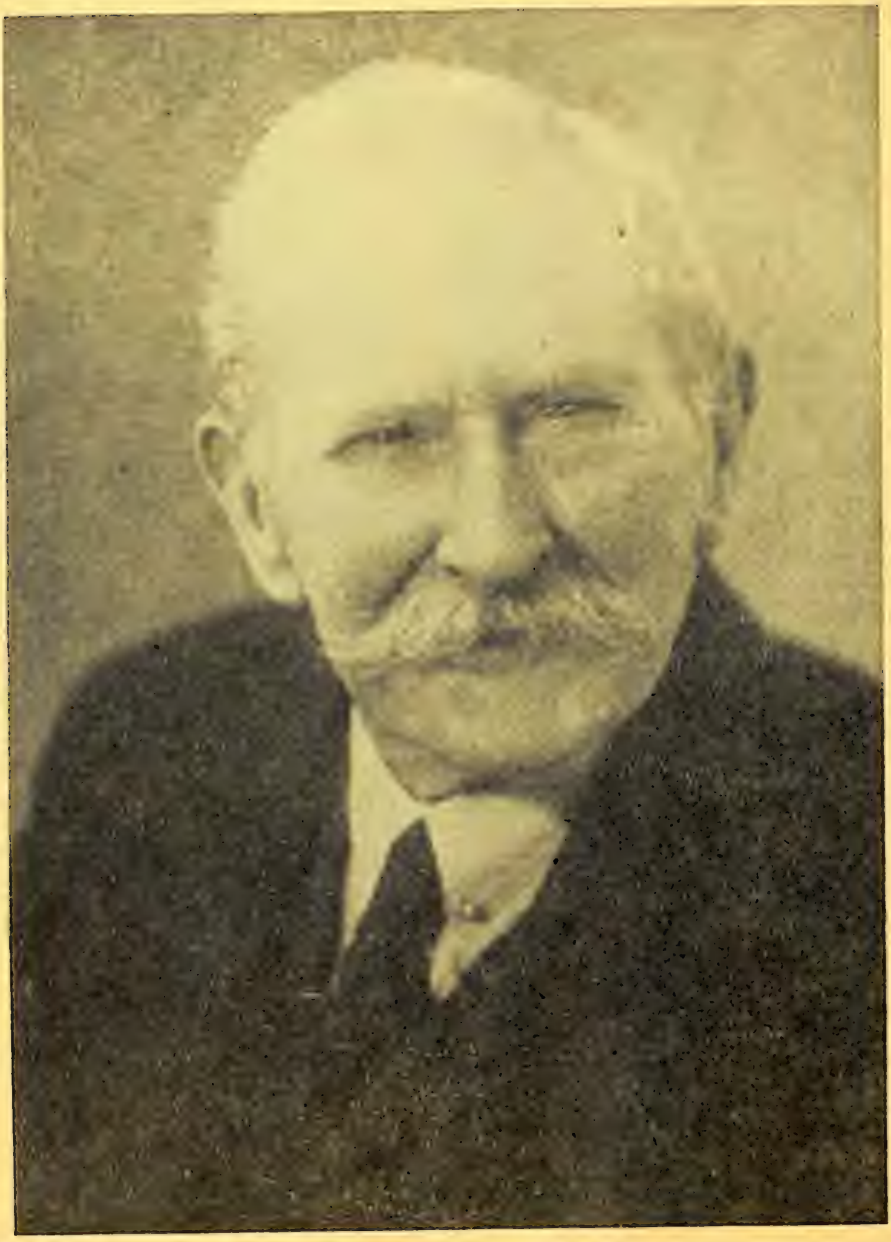
L. McI. TERRILL
Montreal, Quebec

WILLIAM HENRY MOUSLEY was born at Taunton, Somersetshire, England, on February 17, 1865, the son of William Henry and Sarah Anne (Whittle) Mousley. He was educated at Clifton College in Bristol and later entered the business of his father, a railway contractor. In 1885, he married Alice Maud Mary Lake of Wakefield, Yorkshire. They were blessed with the large family of eight daughters and four sons, of whom five daughters and two sons survive. His wife died in 1938.

Mr. Mousley—"Henry", as he was familiarly known to his friends — became interested in natural history at the early age of six upon finding his first bird's nest. Coming to Canada with his family in 1910, he settled at Hatley in Compton County in the Eastern Townships of Quebec where he found ample opportunity to develop his studies in natural history, as there had been very little previous research in the district. During this period (1910-1924) his list of birds reached 194. Although birds were his chief interest he was also a botanist and an entomologist of distinction, specializing in orchids, ferns, and butterflies. Through his initiative, Hatley became quite famous for its orchids, forty-three species and varieties having been found there. Probably his many studies of the orchids, published in various journals in Canada, the United States and England, are amongst his most valuable contributions to science.

Henry Mousley was always tremendously thrilled at a new discovery — a new bird habit, a new variety of orchid or fern, an extension of range, or, in fact, anything pertaining to his chosen subjects that had not already been described. I shall always remember the excitement in his voice when he made such a find one day on the slopes of Orford Mountain. "I've got it, I've got it!" he cried. He had seen a butterfly lay an egg which had never been found before. It was merely the egg of an insect, but new to science.

Moreover, Henry Mousley never neglected to place his discoveries on record, and his published papers on birds, butterflies, ferns and orchids, numbering over one hundred and thirty, now form a fitting tribute to his memory. They are to be found in many



WILLIAM HENRY MOUSLEY

1865 - 1949

publications, notably The Auk, The Canadian Field-Naturalist, The Wilson Bulletin, and in numerous other journals more or less devoted to natural history.

Mr. Mousley's interest in birds commenced in Cumberland, England, in 1871, upon his discovery, at the age of six, of a nest of the Spotted Flycatcher. As the first bird to greet him on his arrival in Hatley was another flycatcher, the Kingbird, it is fitting that his latest published article, which appeared in the Provancher Society's Annual Report for 1946, was on the nesting of the Kingbird.

This detailed description well illustrates the thoroughness of the author who was always most meticulous in his studies. His records attest to this. These are contained in several handsomely bound volume, in the form of reprints of his articles, with photographs, supplemented by many notes inscribed in his exceptionally neat and legible handwriting. One of these, on the flora and fauna of Hatley, was donated to the Wood Library of Ornithology, McGill University. Others have been presented to the Provincial Museum at Quebec.

For several years I had known Henry Mousley only as a correspondent. Then, one day, I met him by appointment on his arrival in Montreal. His features were wholly unknown to me, yet I unhesitatingly picked him out in the crowd as he stepped from the train. Possibly the natural unaffectedness of his friendly, smiling countenance was the magnet. It seemed unthinkable that a frown would dare to cross that serenely smiling face, yet, on occasion, when thoroughly aroused by just anger, the blood would surge and the keen eyes flash. However, these occasions were few. He was most unselfconscious, of which there is abundant proof in the group photographs taken at the numerous meetings of the American Ornithologists' Union he attended. He was a full member of the Union.

After coming to Montreal in 1924, Mr. Mousley became a member of the Province of Quebec Society for the Protection of Birds, taking a prominent part in the various activities of the Society. He served as Honorary Treasurer for twenty years and was made a life member upon his retirement from the Board. We have greatly missed his genial presence at our meetings and now that we can no longer drop in for a chat with him in his home, amidst his books and pictures and other treasures, we shall miss him even more.

Somewhat late in life, Mr. Mousley became interested in photography as an aid to his studies of birds and plants. Photography became almost a passion with him and in the course of time he built up a notable collection of mounted enlargements, numbering over five hundred and fifty. The majority of these are now in the Provincial Museum at Quebec. He also had many slides prepared for use in his lectures. These were donated to McGill University for such use as might be found for them. His collections of birds and their nests and eggs are for the most part in the National Museum at Ottawa, and the Redpath Museum at McGill University, while his plant specimens are in various herbariums in Canada and the United States, chiefly at the Montreal Botanical Gardens and in the National Museum.

For a number of years, Mr. Mousley was employed in the Wood Library of Ornithology at McGill. It was while compiling a list of drawings and paintings in the Wood Library that he discovered some interesting drawings depicting the flexibility of the upper mandible of the Woodcock's bill. It was this discovery that induced him to prepare his "Historical Review of the Woodcock" which was published as a special number of the Canadian Field-Naturalist (vol. 49, no. 1, 1935).

The majority of Mr. Mousley's published articles on birds, however, concerned their intimate home life. He spent a great deal of time watching them at their nests and added much to our knowledge of their habits. Even in the last years of his life, although, naturally, less active, he still made periodical trips with his camera to favoured haunts. Adding a new bird to his photographic trophies always provided a thrill.

One of the notable incidents in Mr. Mousley's life occurred in 1937 when he became a great grandfather. Would that he could have achieved his hope to see his great great grand children! But this was not to be. The recurrence of an illness resulted in his death on September 22, 1949, in the Montreal General Hospital.

THE RING-NECKED DUCK (AYTHYA COLLARIS) IN THE COUNTIES OF KAMOURASKA AND L'ISLET, PROVINCE OF QUEBEC [1]

ABBÉ RENÉ TANGUAY
Ste. Anne de la Pocatière, Quebec

FOR SEVERAL YEARS past I have been investigating the fauna of this region. For this purpose I have traversed, in almost every direction, the bank of the St. Lawrence, the fields, the wood and the lakes. In January, 1945, one of my friends, Mr. R. Cayouette, of the Charlesbourg Zoological Garden, published in 'The Auk', the third authentic record of the breeding of the Ring-necked Duck in the Province of Quebec. I immediately conceived the idea of making investigations in our region in order to throw some light on this matter.

I began by consulting suitable books for information on the species and its environment. Then I started my field investigations, in the course of which I visited the following lakes and bog:

Lake Bourgelas
Green or Gamache Lake
Star or Crowned Lake
Meadow Lake
Otter Lake
The Bog

Green, Crowned, and Meadow Lakes are in L'Islet County; the others mentioned are in Kamouraska County. I began my search on the shore of Green Lake. This lake, which is readily accessible, is in the south-eastern part of Ste. Louise parish. It is a mile long and five or six hundred feet wide. A sheer cliff about 75 feet high, crowned with aspen and birch, overhangs the north shore. The south shore is wooded; aquatic vegetation is abundant at both ends of the lake.

At this lake, both at the end of April and in mid-May, 1946, I found two adult Ring-necked Ducks, which I was able to observe at leisure. Thus I knew that the species was to be found there, at least in spring migration. Unfortunately I was unable to continue my observations that year.

Next I went to the bog. This bog, of small extent, a few hundred feet long and about 75 feet wide, contains a few scattered cedars and black spruce, with aquatic plants bordering a pond. On the second visit, July 4, 1947, I found a nest containing 8 eggs and, like a bird of prey, I took two of them. A little later, about July 18, at the same place, I caught a glimpse of a mother duck and her five ducklings, which swam about on the pond, and on perceiving me, hid quickly among the bulrushes without my being able to identify them with certainty.

These successive discoveries induced me to continue my investigations. On July 13, 1947, I visited Otter Lake, at Lapointe, on the Transcontinental railway line. This shallow lake, flecked with yellow water lilies and algal growth is a mile and a quarter long. A strange duck, I was told, had been observed on this lake. We set out in a canoe to look for the family and this time I succeeded in capturing a duckling in a net.

On September 23, 1947, I shot at Green Lake what I took to be a young Ring-necked Duck, and on the 25th I obtained another. After numerous trips to very different localities, I then had in my possession plenty of promising material, namely, a photograph of a duck's nest, two eggs, a duckling, and two immature ducks.

As for the young ducks taken in the autumn of 1947, I was practically certain of their identification. For greater certainty, I sent one specimen to Madame B. Langelier, at the Provincial Museum and I consulted Dr. H. F. Lewis and Mr. W. Labrie. They confirmed my identification. The birds I had were Ring-necked Ducks. As for the eggs, I first sent one to Messrs. Terrill and Smith, ornithological experts at Montreal. Although they were not positive, they thought it was an egg of a Ring-necked Duck. A second egg was sent first to Madame Langelier at Quebec and thence to Montreal. The opinion was the same in each case — an egg of a "bluebill", but without being sure of the exact species. Not being satisfied with this conclusion, I

1) Received for publication May 2, 1949.

sent an egg to Mr. W. Earl Godfrey, of the National Museum of Canada. This in part is what he wrote to me:

"The two downy ducklings and one egg, which you mentioned in your letter of January 22 as being sent to me for identification, have arrived in good condition.

"No. 395 is *Anas acuta tzitzihoa*

"No. 558 is *Aythya collaris*

"The egg however, is a difficult thing to identify certainly. While I could not be absolutely sure, I believe this to be the egg of *Aythya collaris,* the Ring-necked Duck."

After two years of investigation, I had the joy of seeing my efforts crowned with success beyond my hopes. I could, with the utmost certainty, and with proof to support it, claim the fourth record of the breeding of the Ring-necked Duck in the Province of Quebec.

The nest may be described as follows:

Site: About 75 feet from the pond and about one foot from the inlet, on the ground, well hidden by small bushes or tall vegetation, presented a rather flattened appearance.

Dimensions: Outside diameter, 10½ inches; inside diameter, 7 inches; depth, about 4 inches.

Materials: Grass or straw, lichens and moss, lined with a few fragments of rushes lightly covered with down.

Eggs: Eight in number, deep olive or buff, oval in shape, 2.26 inches by 1.57 inches. They were normally placed. One egg weighed one and ten-sixteenths ounces.

CHRISTMAS BIRD CENSUS — 1949 [1]

Wolfville, Kings Co., N.S.—(Within radius of 10 miles). — Dec. 24, 1949; 9 a.m. to 4.30 p.m.; temp. about 30°F.; ground bare; no wind; approx. 50 miles by auto with frequent side trips on foot; two observers. Canada Goose, 210; Black Duck, 31; American Merganser, 23; Eastern Red-tailed Hawk, 1; Ruffed Grouse, 2; Partridge, 25; Ring-necked Pheasant, 34; Great Black-backed Gull, 12; Herring Gull, 225; Great Horned Owl, 1; Northern Flicker, 2; Northern Horned Lark, 1; Northern Blue Jay, 40; Northern Raven, 4; Eastern Crow, 312; Black-capped Chickadee, 9; Eastern Mockingbird, 1; Common Starling, 66; English Sparrow, 191; Common Red-poll, 26; Eastern Goldfinch, 33; Slate-colored Junco, 56; Eastern Tree Sparrow, 7; White-throated Sparrow, 1; Eastern Song Sparrow, 7. Total 25 Species, 1320 individuals. — R. W. Tufts, John Erskine.

Port Mouton, Queens Co., N.S.—(Within radius of 6 miles). — Dec. 25, 1949; 9 a.m. to 2.30 p.m.; temp. 14 to 22° F.; ground bare, slight N. W. wind; about 20 miles by auto with frequent side trips on foot; one observer. Canada Goose, 3,000; Black Duck, 300; Green-winged Teal, 5; American Golden-eye, 2; American Merganser, 4; Eastern Goshawk, 1; Eastern Red-tailed Hawk, 1; Northern Bald Eagle, 1; Ruffed Grouse, 4; Great Black-backed Gull, 4; Herring gull, 50; Northern Hairy Woodpecker, 1; Northern Blue Jay, 6; Northern Raven, 1; Eastern Crow, 4; Black-capped Chickadee, 16; Eastern Robin, 1; Red-winged Blackbird, 1. Total 18 species, 3402 individuals. — Dr. H. F. Tufts.

Quebec, Que. — (same area as in 1948; town suburbs 13%, fields 19%, coniferous forests 15%, deciduous woods 10%, mixed woodlands 36%, shores 7%). — Dec. 28; 7:30 a.m. to 4:30 p.m.; cloudy; temp. 31°F. at start, 22°F. at return; wind N. W., 18-25 m.p.h.; 5-12 in. snow on ground in the woods, fields almost bare; small rivers open; no ice on St. Lawrence River; six observers in 3 parties; total hours, 17 (on foot); total miles, 18 (on foot). American Merganser, 1; Bald Eagle (?), 1 (dark plumage, seen for 5 minutes at range of 150 to 2,000 feet, without binoculars, L.-A.L.); Ring-necked Pheasant, 6; Ruffed Grouse, 1; Hairy Woodpecker, 1; Downy Woodpecker, 1; Black-capped Chickadee, 19; Starling, 3; English Sparrow, 37; Evening Grosbeak, 5; Pine Grosbeak, 2; Common Redpoll, 31; Slate-colored Junco, 1; Snow Bunting, 14. Total 14 species; 123 individuals. (Seen in area Jan. 1, Iceland

[1] Received for publication February 10, 1950.

Gull, 4, Great Black-backed Gull, 1; Dec. 18 and 20, Brünnich's Murre, 2; Dec. 18, Great Horned Owl, 1; Dec. 24, Bohemian Waxwing, 3; Cedar Waxwing, 2.) — Louis-A. Lord, Jean and Gilbert Lord, Jacques Talbot, François Hamel, Raymond Cayouette (La Société Zoologique de Québec).

Montreal, Que. — (Mont Royal Westmount Mountain, LaSalle, Ahuntsic, Côte St. Luc, St. Lambert and Brosseau woods, Montreal South, Montreal West, south shore of St. Lawrence R. from the Mercier Bridge to Jacques Cartier Bridge and north shore from Dorval to Victoria Bridge, Heron Island, Goat Island, St. Helen's Island, Cartierville, Back River to Viau Bridge).—Dec. 26, 1949; Overcast; wind S. E., 14 to 18 m.p.h.; min. temp. 40°F., max. 43°F.; depth of snow in open country, nil.; 34 observers in 12 parties; total hours, 66; total miles, 228 (46 on foot, 6 by boat, 176 by car). Mallard, 71; Black Duck, 1500 (partly estimated); Pintail, 1; Greater Scaup Duck, 4; American Goldeneye, 770 (part. est.); American Merganser, 92; Goshawk, 2; Sparrow Hawk, 2; Ruffed Grouse, 1; Ring-necked Pheasant, 143; Glaucous Gull, 17; Iceland Gull, 9; Great Black-backed Gull, 61; Herring Gull, 615 (part. est.); Ring-billed Gull, 12; Rock Dove, 10; Snowy Owl, 4; Flicker, 1; Hairy Woodpecker, 4; Downy Woodpecker, 11; Crow, 13; Black-capped Chickadee, 61; White-breasted Nuthatch, 8; Brown Creeper, 5; Winter Wren, 1; Northern Shrike, 2; Starling, 558 (part est.); English Sparrow, 781 (not fully est.); Pine Grosbeak, 5; Common Redpoll, 5; American Goldfinch, 12. Total 31 species; approx. 4782 individuals. (Seen Dec. 18, Brünnich's Murre, 6 (Terrill); Dec. 23, Duck Hawk (Montgomery); Dec. 25, Robin, Pine Siskin). — J. P. Anglin, Miss R. Blanchard, P. N. Boultbee, Mrs. P. N. Boultbee, H. A. Bunker, Mrs. H. A. Bunker, J. D. Cleghorn, J. A. Decarie, F. DeKinder, P. DuBoulay, Mrs. P. DuBoulay, Rev. Brother V. Gaboriau, Miss M. Glynn, G. H. Hall, Miss G. E. Hibbard, J. Hirayama, H. A. C. Jackson, C. MacInnes, Rev. Brother Matthias, I. McLaren, G. H. Montgomery Jr., Mrs. G. H. Montgomery, W. Rawlings, J. W. Robinson, Dan Ryan Sr., G. Sanderson, Dr. D. M. Scott, H. F. Seymour, J. Somerby, C. H. Sullivan, L. McI. Terrill, Mrs. L. McI. Terrill, Dr. F. R. Terroux, Dr. K. G. Terroux.

Hudson Heights, Hudson and Como, P.Q.— (Whitlock Bird Sanctuary of 1150 acres, of which 200 golf course, remainder mixed farm lands and woodlots; villages above named. Total area extends from Harwood Road on west eastward about 4½ miles to a line parallel to and about ½ mile east of Como Station Road, and between the Montreal — Ottawa highway on south and shore of the Lake of Two Mountains on the north; the eastward end of the area extends about ½ mile southward of highway 17. Exclusive of residential areas and sanctuary the area is about 50% farmlands and 50% deciduous and mixed woods). — Dec. 31, 1949; 7: a.m. to 4:30 p.m.; sunny; temp. 2° to 17°F.; wind light, variable, 1-3 m.p.h.; bar. 29.80; ground partly covered 2 inches snow, water frozen except in a few ditches; 26 observers in 10 parties; total hours, 43 (on foot); total miles 52 (on foot). Ruffed Grouse, 8; Pileated Woodpecker, 2; Hairy Woodpecker, 9; Downy Woodpecker, 9; Blue Jay, 85; Crow, 1; Black-capped Chickadee, 184; White-breasted Nuthatch, 17; Red-breasted Nuthatch, 5; Starling, 62; English Sparrow, 47; Evening Grosbeak, 99, Pine Grosbeak, 17; Redpoll, 34; Pine Siskin, 16; Slate coloured Junco, 17; Tree Sparrow, 4. Total, 17 species; 616 individuals. (Seen in area during period, Brown Creeper.) — Pat Baird, Ada Bonnard, Vi. Bryan, Amy Clarke, Audry Clarke, Marnie Clarke, Ed. Croll, Eunice Croll, Wendy Gray, George Gurden, Mack. Johnson, Althea Macaulay, Dunbar Mullan, John Mullan, Mary Mullan, Dolly Nelson, Geof. Ommanney, Kate Ommanney, Geo. M. Patterson, Gwen. Pinhey, Betty Puxley, George Riley, Sr., Drucilla Riley, Sr., Drucilla Riley, May Riley, Mac. Yuile.

Ottawa, Ont. — Dec. 26, 1949; 8 a.m. to 4 p.m.; temp. 23° to 42°F.; mod. S. E. breeze; heavy haze and low cloud; steady, light rain started 9.30 a.m.; one-half inch snow early, gone by noon; much open water; 18 observers; 45 miles on foot, 82 by car.—Holboell's Grebe, 1; Black Duck, 2; American Goldeneye, 322; American Merganser, 19; Red-breasted Merganser, 13; Sparrow Hawk, 1; Ruffed Grouse, 2; Ring-necked Pheasant, 2; Glaucous Gull, 2; Herring Gull, 51; Rock Dove, 274; Hairy Woodpecker, 1; Downy Woodpecker, 3; Crow, 3; Black-capped Chickadee, 41; White-breasted Nuthatch, 6; Brown Creeper, 1; Ruby-crowned Kinglet, 1; Northern Shrike, 1; Starling, 524; English Spar-

row, 506; Pine Grosbeak, 14; Pine Siskin, 1; Snow Bunting, 1. Total, 24 species, 1792 individuals. — A. E. Bourguignon, Ken. Bowles, Art. Brown, Graham Cooch, Dr. and Mrs. C. Frankton, R. Frith, Dr. and Mrs. J. W. Groves, Dr. H. F. Lewis, H. Lloyd, D. A. MacLulich, P. McMillan, Dr. and Mrs. D. B. O. Savile, John Smith, R. Vockeroth.

Pakenham, Lanark Co., Ont. — Dec. 26, 1949; 8.30 a.m. to 3 p.m.; overcast, fresh breeze; ground bare, streams open; temp. 40° to 43°F.; rain 9 to 10 a.m. and steadily from 1 p.m.; visibility and audibility poor; 5 observers in morning, two in afternoon; total miles, 14 on foot. American Merganser, 1; Ruffed Grouse, 2; Herring Gull, 1; Hairy Woodpecker, 1; Blue Jay, 1; Black-capped Chickadee, 20; White-breasted Nuthatch, 1; Starling, 24; English Sparrow, 74; Evening Grosbeak, 2; Purple Finch, 1. Total: 11 species, 128 individuals. (Dec. 15: Pine Grosbeak, 2). — Edna G. Ross, Verna M. Ross, Douglas Deugo, T. W. Ross, R. M. McKenzie, Bill McKenzie.

Kingston, Frontenac Co., Ont.—(selected areas within — 15 mile radius — farmland 43%, woodland 8%, marshland 2.6%, tow 0.4%, water 46%). — Dec. 26, 1949; 9 a. to 4.45 p.m.; overcast with rain, foggy pa of time; no snow; temp. 40° to 45°F. Wi 10 to 15 m.p.h., variable; L. Ontario a St. Lawrence R. open; small bays, rivers a marshes mostly frozen; 12 observers, 2 pa ties; total man hours 67, total miles, on fo 50, by car 125. Black Duck, 7; Scaup Du (sp.), 300; American Golden-eye, 9; Re breasted Merganser, 2; American Sparr Hawk, 1; Ruffed Grouse, 11; Ring-neck Pheasant, 2; Glaucous Gull, 15; Great Blac backed Gull, 40; Herring Gull, 431; Rin billed Gull, 8; Rock Dove, 41; Great Horn Owl, 2; Belted King-fisher, 1; Hairy Woo pecker, 1; Downy Woodpecker, 5; Americ Crow, 2; Black-capped Chicadee, 72; Whit breasted Nuthatch, 7; Red-breasted Nuthatc 1; Northern Shrike, 1; Common Starlin 140+; English Sparrow, 200+; Tree Sparro 36; Chipping Sparrow (W.G.L.), 3. Total species, 1939+ individuals. (Seen recentl Canada Goose, Snowy Owl, Blue Jay, Brow Creeper, Pine Siskin). — A. E. S. Bell, M and Mrs. T. Boardman, John Cartwright, Hyde, W. G. Lamb, B. Morrison, R.

(Continued on page 77)

FIFTH CENSUS OF NON-PASSERINE BIRDS IN THE BIRD SANCTUARIES OF THE NORTH SHORE OF THE GULF OF ST. LAWRENCE [1]

OLIVER H. HEWITT
Department of Conservation, Cornell University, Ithaca, N.Y.

THIS is the fifth of a series of reports on the progress of the Dominion bird sanctuaries on the north shore of the Gulf of St. Lawrence. Since 1925, enumerations have been made at five-year intervals of the populations of non-passerine birds, mostly "sea-birds", in the sanctuaries. The first four censuses were conducted by Harrison F. Lewis in 1925, 1930, 1935 and 1940, and were reported by him in 1925, 1931, 1937 and 1942. The fifth census was made by the author during the summer of 1945. Comparable census reports are available for a period of twenty years for nine of the ten sanctuaries.

[1]) Received for publication July 11, 1949.

As mentioned by Lewis (1942), Cape Whitt Bird Sanctuary was replaced in 1937 Carrousel Island Bird Sanctuary. This repo includes the first comparative census of t bird populations in this sanctuary.

The results of the 1945 census for ea species in each sanctuary are shown in Tab 1, along with the corresponding figures f 1940.

In order to maintain a series of census which would be entirely comparable, a change in census-takers should be made wi an over-lap. However, it was not possible f Dr. Lewis to take part in the 1945 censu The census methods used in the first fo

TABLE 1. — CENSUS OF NON-PASSERINE BIRDS IN THE BIRD SANCTUARIE

SPECIES	Carrousel Island	Birch Islands	Betchouane	Watshishou	SANC Fog Islan
	—	—	—	—	20
Red-throated Loon	—	—	—	—	18
	—	—	—	—	—
European Cormorant	—	—	—	—	—
	310	—	—	70	42
Double-crested Cormorant	272	—	—	60	112
	—	—	—	2	6
Black Duck	—	—	—	4	4
	—	—	—	—	4
Pintail	—	—	—	—	—
	—	—	—	—	8
Green-winged Teal	—	2	—	—	—
	250	1508	1188	1184	664
Common Eider	80	1648	1304	1100	1012
	—	—	—	6	8
Red-breasted Merganser	—	—	—	2	—
	—	—	—	—	2
Willow Ptarmigan	—	—	—	—	2
	—	—	—	—	—
Semipalmated Plover	—	—	—	2	14
	6	14	14	18	4
Spotted Sandpiper	2	12	8	28	30
	2	24	20	156	196
Great Black-backed Gull	4	18	16	156	258
	1100	544	388	208	120
Herring Gull	600	606	460	150	162
	—	—	275	—	110
Ring-billed Gull	—	—	—	—	270
	750	—	27	—	—
Kittiwake	500	—	18	—	—
	—	2	290	410	42
Common and Arctic Terns	—	6	2	308	54
	—	—	—	—	90
Caspian Tern	—	—	—	—	66
	60	—	250	32	24
Razor-billed Auk	56	—	240	28	42
	—	—	—	—	2000
Common Murre	—	—	—	—	3300
	—	—	—	—	—
Brunnich's Murre	—	—	—	—	—
	98	14	—	30	136
Black Guillemot	176	30	—	28	150
	—	—	610	—	—
Puffin	—	—	750	—	—
	2576	2106	3062	2816	3476
TOTALS	1690	2322	2798	1866	5494

OF THE NORTH SHORE OF THE GULF OF ST. LAWRENCE, 1940 AND 1945

JARIES Wolf Bay	St. Mary's Islands	Mecatina	St. Augustine	Bradore Bay	TOTALS 1945	TOTALS 1940
10	16	30	18	—		
6	16	23	22	—	94	90
—	360	—	—	—		
—	172	—	—	—	360	172
340	6	16	—	—		
366	—	—	—	—	784	810
—	—	—	4	—		
—	—	—	6	—	12	14
—	—	—	—	—		
—	—	—	—	—	4	—
—	2	—	—	—		
—	—	—	—	—	10	2
1400	1420	1640	1050	—		
1600	930	1830	1500	—	11004	11004
16	—	—	12	—		
—	—	—	2	—	42	4
—	—	—	—	—		
—	—	—	—	—	2	2
—	4	6	—	6		
—	10	24	20	8	16	78
8	18	16	—	32		
12	20	18	32	8	130	170
152	270	280	320	—		
244	234	1134	902	—	1420	2966
520	750	882	890	—		
280	702	740	812	—	5402	4512
—	—	50	400	—		
—	—	68	58	—	835	396
—	—	—	—	—		
—	—	—	—	—	777	518
6	8	18	—	—		
8	8	26	—	—	776	412
—	—	—	—	—		
—	—	—	—	—	90	66
2600	4058	158	8	1500		
2562	4414	164	4	1386	8690	8896
2000	5248	—	—	120		
2310	6846	—	—	104	9368	12560
—	2	—	—	—		
—	2	—	—	—	2	2
16	222	840	168	—		
4	246	660	172	—	1524	1466
6300	4796	—	—	48304		
9182	6162	—	—	49350	60010	65444
13368	17180	3936	2870	49962		
16574	19762	4692	3530	50856	101352	109584

counts were studied carefully, and these same methods were used in obtaining the present figures.

Comparisons of these results with those of 1940 reveal some rather interesting population similarities and differences, most of which can be readily explained. No significant changes appear in the numbers of those species which are comparatively scarce in the sanctuaries. It is possible that the pair of Brunnich's Murres on Cliff Island in the St. Mary's Islands Sanctuary is the same pair observed by Lewis five years previously. Black Ducks nest in only three sanctuaries, and are much more common inland. An increase in breeding numbers on the outer islands is not to be expected. Red-throated Loons have undoubtedly increased, but because each pair requires a territorial freshwater pond, the increment often must spread to ponds outside of the sanctuary boundaries. A remarquable coincidence is noted in the total counts of the Common Eider Duck. Round figures were used by neither census-taker, and the comparative counts in various sanctuaries vary a great deal. The indications are that the sanctuaries are not yet supporting their full capacity of breeding eiders, and that local populations are considerably affected by adverse and beneficial factors such as predation and decreasing interference by man. The Great Black-backed Gull seems to be the most active predator on the downy young eider ducks. Some regulated control has been carried on through the collection of eggs of this gull. The amount of collecting varies on different parts of the coast. The eggs are used as food by the residents of the north shore, and in the Grenfell Mission Hospital at Harrington Harbour. It was anticipated that in sanctuaries where the Black-backed Gull had decreased, a corresponding increase in eiders would be found. This is not the case, however, as demonstrated by counts in five of the sanctuaries.

Notable changes are apparent in the gull populations from 1940 to 1945. The numbers of Great Black-backed Gulls have decreased in the sanctuaries more than fifty per cent, which may be due to the control programme. Herring Gulls and Ring-billed Gulls show considerable increases. These species nest in colonies which move about occasionally. Such increases may be the result of the shifting of colonies to islands within the boundaries of the sanctuaries. This is plainly what took place at Betchouane Sanctuary, where a large colony of Ring-billed Gulls had appeared. It also explains the increase in Arctic and Common Terns in the same sanctuary. Kittiwakes, on the other hand, nest in the same places, and even on the same nests, year after year. The great increase in the numbers of this beautiful species is actual, and very gratifying. The European Cormorant colony in St. Mary's Islands Sanctuary has shown an excellent increase, and the Fog Island colony of Caspian Terns is growing.

There are other variations in comparative figures which must be explained by the differences between census-takers. A decrease of almost 3200 Common Murres is hardly credible. Actually it is impossible to obtain accurate estimates of the breeding population of this species, which nests in colonies, most of which are hidden or inaccessible among the rocks. The eight per cent decrease in puffins probably can be explained in the same way. The major decreases appear in Wolf Bay and St. Mary's Islands, where accurate counts could not be made. On Perroquet Island, where an accurate and comparative census method was used, only a slight decrease was evident, and the colony appears to be in excellent condition.

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————1937. A decade of progress in the bird sanctuaries of the north shore of the Gulf of St. Lawrence. Can. Field-Nat. 51: 51-55.

————1942. Fourth census of non-passerine birds in the bird sanctuaries on the north shore of the Gulf of St. Lawrence. Can. Field-Nat. 56: 5-8.

CHRISTMAS BIRD CENSUS — 1949

(Continued from page 73)

Stewart, Dr. Geo. M. Stirrett, Mr. and Mrs. L. Thornton, Dr C. J. Vincent. (Kingston Nature Club).

Lindsay, Ont.—(Southwest of town, some river bank, 15% swamp and low woodland, remainder pasture and cultivated land). — Dec. 30, 1949; 7.16 a.m. to 12.20 p.m., and 2.46 to 4.20 p.m.; gentle E. breeze; temp. 5° to 15°F.; half inch of snow; 17 miles on foot. Ruffed Grouse 6; Hairy Woodpecker, 1; Blue Jay, 1; Black-capped Chicadee, 18; Starling, 9; English Sparrow, 20; Pine Grosbeak, 9; Snow Bunting, 50. Total, 8 species, 114 individuals. (Seen during period, Downy Woodpecker, Common Redpoll). — E. W. Calvert.

Rutherglen, Ont.—(15 miles east of North Bay to 10 miles west of Mattawa). — Dec. 30, 1949; black spruce bog, township of Bonfield, village of Bonfield, highway to Rutherglen, Pimisi Bay, Mattawa River, Kennedy Lake, Eau Claire, Smith's Lake and Amable du Fond River; open farmland 20%, coniferous woods and black spruce bog 10%, second growth mixed forest 60%, lakes and rivers 10%; clear to cloudy; temp. 10° to 7°F.; wind N. E. and E. to S., 5 to 10 m.p.h.; ground covered with 2 inches powdery snow; all water except rapids frozen; 8 hours' observation; total miles, 5 on foot, 27 by car. American Goldeneye, 3; Hairy Woodpecker, 8; Downy Woodpecker, 1; Blue Jay, 5; Black-capped Chickadee, 63; Brown-headed Chickadee, 5; White-breasted Nuthatch, 1; Common Redpoll, 79; Snow Bunting, 8. Total, 9 species, approx. 174 individuals. — Louise de Kiriline Lawrence.

Huntsville, Ont.—Dec 19, 1949; 9.30 a.m. to 4:00 p.m.; cloudy; temp. 35° to 40°F.; 4 to 5 inches of soft snow in the bush, ground 50% bare in the open; small bodies of water frozen with water on the ice, larger lakes and streams open; 1 observer; 50 miles by car, 4 miles on foot; chiefly mixed forest. Ruffed Grouse, 4; Herring Gull, 2; Pileated Woodpecker, 1; Hairy Woodpecker, 1; Blue Jay, 6; Black-capped Chickadee, 3; White-breasted Nuthatch, 2; Northern Shrike, 1; Common Starling 1; English Sparrow, 10; Evening Grosbeak, 30. Total, 11 species, 61 individuals. — Russell J. Rutter.

Toronto, Ont. — Dec. 18, 1949; 7 a.m. to 5 p.m.; total hours, 115¾; continuous drizzle all morning, thick fog, all afternoon; temp. 37° to 42°F.; ground bare at city, 3" to 4" in woods; bay and lake open, rivers and ponds frozen; 76 observers in 20 parties. Holboell's Grebe, 1; Horned Grebe, 1; Great Blue Heron, 4; Mallard, 350; Black Duck, 770; Pintail, 3; Shoveller, 12; Greater Scaup Duck, 962; American Golden-eye, 311; Bufflehead, 54; Old-squaw, 403; White-winged Scoter, 2; American Merganser, 53; Goshawk, 1; Cooper's Hawk, 3; Red-tailed Hawk, 7; Rough-legged Hawk, 1; Sparrow Hawk, 9; Ruffed Grouse, 8; Ring-necked Pheasant, 166; Glaucous Gull, 1; Iceland Gull, 1; Great Black-backed Gull, 14; Herring Gull, 2672; Ring-billed Gull, 49; Screech Owl, 3; Horned Owl, 21; Snowy Owl, 3; Barred Owl, 1; Long-eared Owl, 1; Saw-whet Owl, 1; Kingfisher, 4; Flicker, 1; Pileated Woodpecker, 1; Hairy Woodpecker, 18; Downy Woodpecker, 52; Blue Jay, 81; Crow, 54; Black-capped Chickadee, 737; White-breasted Nuthatch, 51; Red-breasted Nuthatch, 18; Brown Creeper, 34; Hermit Thrush, 1;; Golden-crowned Kinglet, 42; American Pipit, 1; Cedar Waxwing, 5; Northern Shrike, 11; Starling, 1742; Myrtle Warbler, 1 (the 125th species for the Brodie Club's 25 Toronto Christmas censuses); House Sparrow, 1570; Eastern Meadowlark, 3; Rusty Blackbird, 1; Cardinal, 68; Purple Finch, 22; Pine Grosbeak, 12; Common Redpoll, 2; Pine Siskin, 15; Goldfinch, 103; Slate-colored Junco, 419; Tree Sparrow, 398; White-crowned Sparrow, 2; White-throated Sparrow, 3; Swamp Sparrow, 1; Song Sparrow, 50. Total, 64 species, 11416 individuals. — F. E. Baillie, J. L. Baillie, J. Barnett, R. Bateman, D. Beacham, F. Bodsworth, A. Brooks, A. Bunker, D. Burton, W. H. Carrick, C. H. D. Clarke, A. Cobden, A. Dawe, M. E. Devitt, O. E. Devitt, F. H. Emery, B. Falls, G. Francis, A. Ghent, G. Giles, W. Giles, A. Gordon, Walter Gunn, W. W. H. Gunn, I. Halladay, R. Hambly, C. Helleiner, F. Helleiner, C. E. Hope, R. F. James, G. Lambert, A. Lamsa, C. Leavens, G. Lentine, N. Martin, W. Martin, K. Mayall, L. McDougall, E. McEwen, M. McIlwraith, D. S. Miller, G. Miller, M. H. Mitchell, C. Molony, F. Mueller, D. Perks, W. Peters, A. Reid, R. Ritchie, B. Runnings, J. Runnings, T. Russell, J. Satterly, R. M. Saunders, D. Scovell, R. Scovell, J. Sherrin, T. M. Shortt, D. Smith, F. Smith, R. A. Smith, W.

W. Smith, H. H. Southam, D. H. Speirs, J. M. Speirs, E. V. Stark, T. Swift, R. Tasker, S. L. Thompson, R. Trowern, V. Trowern, M. Vanderwater, J. B. Walty, D. West, R. Wilson, J. Woodford. (The Brodie Club).

Hamilton, Ont.—(Dundas Valley west to Ancaster, Hamilton and harbor, Burlington Beach, Aldershot, Lake Medad, Bronte). — Dec. 26; 8 a.m. to 5 p.m.; rain intermittent in morning, continuous in afternoon with fog over water; temp. 38° to 44°F.; wind S., light; ground bare; streams and harbor open; 50 observers in 19 parties; total hours, 85; total miles, 172 (101 on foot, 71 by car). Common Loon, 1; Horned Grebe, 6; Gannet, 1 (im., J.L.B., W.W.G., F. Helleiner, R.W.T.); Mallard, 23; Black Duck, 99; Ring-necked Duck, 2; Greater Scaup Duck, 114; Lesser Scaup Duck, 4; American Golden-eye, 257; Buffle-head, 2; Old-squaw, 31; White-winged Scoter, 24; Ruddy Duck, 2 (G.N.); Hooded Merganser, 3; American Merganser, 106; Red-Breasted Merganser, 2; Red-tailed Hawk, 8; Rough-legged Hawk, 1; Bald Eagle, 1; Sparrow Hawk, 13; Ruffed Grouse, 11; European Partridge, 7; Ring-necked Pheasant, 6; Glaucous Gull, 4; Kumlien's Gull, 1 (adult, G.N.); Great Black-backed Gull, 80; Herring Gull, 11,800 (est.); Ring-billed Gull, 300 (est.); Bonaparte's Gull, 3; Screech Owl, 3; Horned Owl, 13; Snowy Owl, 5; Long-eared Owl, 1; Belted Kingfisher, 1; Hairy Woodpecker, 10; Downy Woodpecker, 41; Blue Jay, 64; Crow, 1; Black-capped Chickadee, 292; White-breasted Nuthatch, 29; Red-breasted Nuthatch, 4; Brown Creeper, 18; Robin, 2; Golden-crowned Kinglet, 7; Cedar Waxwing, 23; Northern Shrike, 6; Starling, 916; English Sparrow, 957; Cardinal, 76; Common Redpoll, 20; Pine Siskin, 30; American Goldfinch, 7; Slate-colored Junco, 415; Tree Sparrow, 466; Field Sparrow, 2 (G.N.); White-crowned Sparrow, 1 (P.H., at feeder since Dec. 14); Swamp Sparrow, 1; Song Sparrow, 24. Total, 58 species; 16,347 individuals. (Seen recently; Iceland Gull, Saw-whet Owl, Winter Wren, Catbird (R.E.), Evening Grosbeak, Purple Finch, Mockingbird seen by P. H. Dec. 8). — Dean Axelson, Donald Babbs, Jas. L. Baillie, Eric W. Bastin, Jack Bond, Thelma Boorman, Donald Bourne, Neil Bourne, R.D.F. and Mrs. Bourne, David Campbell, Jack Campbell, Wm. Campbell, Kenneth J. Cox, James Dowell, Robert O. Elstone, Bob Finlayson, Larry Gravefell, W. W. H. Gunn, Ian Halladay, Fred Helleiner, Peter F. Henderson, Fred L. Henderson, Dorothy Henwood, Wm. Holley, Angus B. Jackson, H. E. Kettle, Margaret Lamb, Gordon MacPartlin, Julius Mannheimer, Jack E. Martin, Douglas and Mrs. McCallum, G. O. McMillan, John Moule, Gertrude Nelson, Albert B. Nind, George W. North, James Nuttall, David Powell, Mrs. N. M. Robertson, Bob Sergeant, Laura Stewart, R. W. Trowern, Ann Watson, Mabel Watson, Mr. and Mrs. M. R. Watters, J. Harvey Williams, Laurel Williams. (Hamilton Nature Club).

Kitchener — Waterloo, Ont.—(Westmount through limits of Waterloo, N.E. to Bridgeport; Frederick St. limits; Grand River area at Breslau; Freeport to Doon; and near Galt). —Dec. 31, 1949; clear in a.m., overcast in p.m.; temp. 30° - 42°F.; moderate S. E. breeze decreasing in p.m.; no snow; swamps and ponds frozen, river open; 16 observers in 5 parties; 23 miles on foot. American Merganser, 7; Black Duck, 200; Mallard, 50; American Golden-eye, 25; Ruffed Grouse, 4; Ring-necked Pheasant, 1; Rock Dove, 64; Belted Kingfisher, 2; Pileated Woodpecker, 1; Hairy Woodpecker, 1; Downy Woodpecker, 10; Horned Lark, 1; Blue Jay, 8; Black-capped Chickadee, 291; White-breasted Nuthatch, 13; Red-breasted Nuthatch, 23; Brown Creeper, 33; Winter Wren, 1; Golden-crowned Kinglet, 18; Ruby-crowned Kinglet, 2; Northern Shrike, 1; Starling, 60; English Sparrow, 555; Cardinal, 20; Pine Grosbeak, 8; Pine Siskin, 8; American Goldfinch, 10; Towhee, 1; Slate-colored Junco, 133; Tree Sparrow, 20; Lincoln Sparrow, 2; Song Sparrow, 7. Total, 32 species, 1729 individuals. — F. Bender, C. Bingham, M. Campbell, E. Carter, R. Dickson, R. Hilborn, R. Jilt, R. Pickering, M. Preston, G. Schaefer, W. Schaefer, F. Shantz, P. Smith, D. Wambold, E. Wambold, L. Wambold.

Meaford, Ont.—(E. half of town, including harbour and three feeding stations, 11th line North, St. Vincent township). — Dec. 27, 1949; 10 a.m. to 4 p.m.; overcast, intermittent drizzle, visibility fair; light to strong W. wind; temp. 45°F.; 10 observers. Horned Grebe, 1; American Merganser, 6; American Golden-eye, 5; Ruffed Grouse, 12; European Partridge, 3; Herring Gull, 30; Rock Dove, 3; Pileated Woodpecker, 1; Downy Woodpecker, 4; Hairy Woodpecker, 1; Blue Jay, 3; Black-capped Chickadee, 60; White-breasted Nut-

hatch, 3; Golden-crowned Kinglet, 4; Starling, 85; Cardinal, 1; English Sparrow, 162; Snow Bunting, 50. Total, 18 species, 432 individuals. — L. H. Beamer.

St. Thomas, Ont. — (Waterworks marsh, Pinafore Park, Kettle Creek at Union, Port Stanley harbour, Springwater. Cattail marsh 5%, pasture land 5%, deciduous woods 5%, lake shore 25%, creek banks 60%). — Dec. 26, 1949; 8 a.m. to 3 p.m.; completely overcast; intermittent rain until 10 a.m. then continuous rain for rest of day; wind E., 5 m.p.h.; temp. 40°F.; no snow on ground; 5 observers in 4 parties; total hours, 12½ (6 by car, 6½ on foot); total miles, 55 (50 by car, 5 on foot). Canada goose, 12; American Golden-eye, 3; Black Duck, 200 (est.); Mallard, 12; Red-breasted Merganser, 1; Herring Gull, 250 (est.); Red-tailed Hawk, 4; Mourning Dove, 2; Screech Owl, 1; Snowy Owl, 1; Downy Woodpecker, 20; Hairy Woodpecker, 1; Blue Jay, 4; Crow, 1; Black-capped Chickadee, 60; White-breasted Nuthatch, 6; Brown Creeper, 4; Winter Wren, 1; Golden-crowned Kinglet, 2; Starling, 25; English Sparrow, 60; Cardinal, 9; Purple Finch, 5; American Goldfinch, 10; Slate-coloured Junco, 50; Tree Sparrow, 100 (est.); Song Sparrow, 6. Total, 27 species, about 850 individuals. (Seen in area; Belted Kingfisher, Dec. 24; Pileated Woodpecker, Dec. 27). — Fred Bodsworth, Ron Brooman, Marshall Field, Ken McCaw, Donald Young.

London, Ont. — (Valley of Thames River from London to Delaware; Redman's Swamp; Trott's Swamp; Coves; part of Dorchester Swamp; J. C. Higgins Farm at Lobo; 3 feeding stations in same area. Pasture 5%; deciduous woodland 20%; swamp 20%; mixed wooded river bank 55%). — Dec. 26, 1949; 8 a.m. to 4.30 p.m.; overcast, rain starting at dawn and continuing all day; visibility very poor; wind S. W., slight at first, 5-10 m.p.h. later in day; ground bare; temp. at 8 a.m. 40°F.; river approx. 8-10 ft. above normal; streams swollen; ponds almost entirely free of ice; 31 observers in 10 parties observing mostly in the morning; total party hours 60; total party miles, 50 on foot, 75 by car. Great Blue Heron, 1; Black Duck, 6; American Golden-eye, 69; American Merganser, 9; Sharp-shinned Hawk, 2; Cooper's Hawk, 1; Red-tailed Hawk, 7; American Rough-legged Hawk, 1; Bald Eagle, 1; Ruffed Grouse, 8; Ring-necked Pheasant, 15; Herring Gull, 29; Ring-billed Gull, 1; Rock Dove, 67; Mourning Dove, 9; Screech Owl, 3; Great Horned Owl, 2; Snowy Owl, 3; Belted Kingfisher, 1; Flicker, 1; Pileated Woodpecker, 1; Hairy Woodpecker, 4; Downy Woodpecker, 38; Blue Jay, 77; Crow, 13; Black-capped Chickadee, 219; White-breasted Nuthatch, 22; Brown Creeper, 18; Winter Wren, 1; Golden-crowned Kinglet, 30; Cedar Waxwing, 7; Common Starling, 152; English Sparrow, 313, Bronzed Grackle, 1; Cardinal, 124; Evening Grosbeak, 3; Purple Finch, 14; Common Redpoll, 1; Pine Siskin, 2; American Goldfinch, 30; Slate-coloured Junco, 164; Tree Sparrow, 172; White-throated Sparrow, 2; Song Sparrow, 16; Swamp Sparrow, 2. Total, 45 species, 1,662 individuals. (Observed in area recently, Canada Goose, Dec. 21; Mallard, Dec. 24; Long-eared Owl, Dec. 17; Northern Shrike, Dec. 17; Eastern Meadowlark, Dec. 22). H. Calvert, Dr. and Mrs. R. G. Cummings, John and Tom Cummings, A. Clendinning, Eli Davis, Vernon Franks, Ted Garside, Frank Girling, William Girling, Frances Girling, John Harvey, Mary Harvey, John Higgins, Mrs. C. Landery, Mrs. F. Landon, Jack Laughton, Gretchen Lawton, Jim Leach, Fred Lewis, Allan Loughrey, William Morris, Donald Pope, Keith Reynolds, Matthew Schoenfeld, Douglas Soper, Margaret Stevens, Charles Whitelaw, John and David Wismer. (McIlwraith Ornithological Club).

Ripley, Ont.—(Village and country within 3 miles, mostly open farm lands with some woodlots). — Dec. 31, 1949; mild, overcast, ground bare; 3 observers in one party. Pigeon Hawk, 1; Herring Gull, 10; Screech Owl, 1; Horned Owl, 2; Snowy Owl, 1; Richardson's Owl, 1; Hairy Woodpecker, 1; Downy Woodpecker, 3; Black-capped Chickadee, 1; White-breasted Nuthatch, 1; Brown Creeper, 2; Starling, 150; English Sparrow, 500, Slate-coloured Junco, 15. Total, 14 species, 702 individuals. — Ian Gibbons, Clare Thuell, Albert Wylds.

West Elgin, (Aldboro and Dunwich Twps.), Ont.—(area within 7½ mile radius of West Lorne; pine woods 2%, deciduous woods 50%, lake shore 10%, river banks 15%, grassy marsh 10%, pasture land 13%).—Dec. 27, 1949; 7.45 a.m. to 5.15 p.m.; low overcast during morning with almost continuous rain,

foggy; wind E., 8 m.p.h., increasing at mid-day to 25-30 m.p.h. and veering to W. as overcast broke to high, scattered cloud; temp. 36° at start, 43° at mid-day, 34° at finish; lake and river free of ice; river and tributaries almost bank full of water; ground bare; 5 observers in 2 parties; total hours, 17 (16 on foot, 1 by car); total miles, 28 (15 by car, 13 on foot). American Golden-eye 51; Black Duck, 1; Mallard, 5; Red-tailed Hawk, 5; Red-shouldered Hawk, 1; American Rough-legged Hawk, 3; Marsh Hawk, 5; Bald Eagle, 1; American Woodcock, 1; Herring Gull, 10; Ring-billed Gull, 2; Rock Dove, 16; Mourning Dove, 25; Downy Woodpecker, 8; Horned Lark, 3; Blue Jay, 7; Crow, 1; Black-capped Chickadee, 36; Brown Creeper, 2; Carolina Wren, 1; Robin, 1; Golden-crowned Kinglet, 2; Starling, 18; English Sparrow, 109; Cardinal, 3; Red-eyed Towhee, 1; Slate-coloured Junco, 70; Tree Sparrow, 98; Song Sparrow, 1. Total, 29 species, 489 individuals. (Seen recently, Sharp-shinned Hawk, Lapland Longspur, Dec. 23; Sparrow Hawk, Dec. 24; Cooper's Hawk, Snowy Owl, Meadowlark, Dec. 25; White-breasted Nuthatch, Screech Owl, Dec. 26).— H. L. Lancaster, J. K. Lancaster, R. E. Lemon, V. E. Lemon, Allan Streib. (West Elgin Nature Club).

Point Pelee, Ont. — (area within 7½ mile radius centred about 1 mile north of the boundary of the National Park; includes the Park and agricultural land to north enclosed by an arc from the Lake shore S. of Ruthven, passing 1 mile S. of Blytheswood and back to the lake shore 1 mile E. of Wheatley; lake shore 30%, cedar woods 10%, deciduous woods 30%, agricultural land 15%, cattail marsh, 15%) — Dec. 29, 1949; 7.45 a.m. to 5.15 p.m.; cool; clear during morning, high scattered cloud during p.m.; wind N., 12 m.p.h.; no snow on ground, drifting ice in lake along west shore of Point, light skim of ice on marsh during a.m.; 6 observers in 2 parties. Total hours, 18 (16 on foot, 2 by car); total miles, 69 (49 by car, 20 on foot). Black Duck, 36; American Golden-eye, 116; Buffle-head, 12; American Merganser, 235; Red-breasted Merganser, 19; unidentified duck, 192; Sharp-shinned Hawk, 1; Cooper's Hawk, 1; Red-tailed Hawk, 3; Red-shouldered Hawk, 2; American Rough-legged Hawk, 3; Bald Eagle, 3; Marsh Hawk, 1; Ring-necked Pheasant, 8; Herring Gull, 200 (est.); Ring-billed Gull, 4; Great Horned Owl, 2; Snowy Owl, 2; Hairy Woodpecker, 2; Downy Woodpecker, 13; Horned Lark, 4; Blue Jay, 2; Crow, 502; Black-capped Chickadee, 127; White-breasted Nuthatch, 2; Brown Creeper, 5; Winter Wren, 4; Golden-crowned Kinglet, 11; Northern Shrike, 1; Starling, 32; English Sparrow, 227; Red-winged Blackbird, 4; Rusty Blackbird, 1; Cow-bird, 550, (est.); Cardinal, 23; American Goldfinch, 75; Red Crossbill, 1 (R.B., A.A.W., C.H.Z.); Slate-coloured Junco, 15; Tree Sparrow, 70; Song Sparrow, 9; Swamp Sparrow, 3. Total, 40 species, about 2536 individuals. (Seen just outside area, 2 more snowy owls). — Richard Blackburn, Hugh Evans, H. L. Lancaster, Allan Streib, A. A. Wood, C. H. Zavitz. (Combined Kent and West Elgin Nature Clubs).

Port Arthur - Fort William, Ont. — Dec. 26, 1949; 9.30 a.m. to 4.30 p.m.; temp. 8° to 4° F.; wind W.S.W. 10 m. p.h. to variable light airs; clear to hazy; 3 inches snow on level; rel. hum. 85% at 1.30 p.m.; 15 observers in 9 parties; total miles, 252 by car, 14½ on foot. Black Duck, 1; American Golden-eye, 16; American Merganser, 1; Ruffed Grouse, 2; European Partridge, 5; Herring Gull, 124; Rock Dove, 257; Snowy Owl, 2; Pileated Woodpecker, 3; Hairy Woodpecker, 3; Downy Woodpecker, 12; Arctic three toed Woodpecker, 1; Canada Jay, 5; Blue Jay, 15; Raven, 10; Crow, 8; Black-capped Chickadee, 98; Hudsonian Chickadee, 3; Red-breasted Nuthatch, 2; Bohemian Waxwing, 20; Northern Shrike, 2; Starling, 133; English Sparrow, 289; Evening Grosbeak, 16; Pine Grosbeak, 37; Common Redpoll, 8; Slate-coloured Junco, 1; Snow Bunting, 15. Total, 28 species, 1089 individuals. — Dr. A. E. Allin, Ken Campbell, Keith Denis, Claude Garton, Elliott Heslop, James Thompson, Jack Smith, Dr. and Mrs. H. J. Ferrier, Mr. and Mrs. C. H. Philpot, Mrs. W. Knowles, Mrs. Carl Rydholm.

Yorkton, Sask.—(area 15 miles in diameter with Yorkton as center). — Dec. 26, 1949; 9 a.m. to 4.30 p.m.; overcast with snow flurries in morning, clear in afternoon; temp. O°F. at start, 6°F. at noon; wind E. 3 m.p.h.; snow averaging three inches in depth; 12 observers in 4 groups; total party-hours afield, 11½ (6 by car, 5½ on foot); total party miles, 40 (34 by car, 6 on foot). Ruffed Grouse, 2; Sharp-tailed Grouse, 46; European

Partridge, 28; Downy Woodpecker, 2; Canada Jay, 2; Magpie, 8; Black-capped Chickadee, 17; White-breasted Nuthatch, 1; English Sparrow, 441 (est.); Common Redpoll, 38; Snow Bunting, 821 (est.). Total, 11 species, approximately 1406 individuals. (Snowy Owl, Dec. 22 and Dec. 27; Bohemian Waxwings noted Dec. 24 and Dec. 28). — Wayne Bjorgan, Jerry Bulitz, Lionel Coleman, Doug. Logan, D'Arcy Wershler, Merle Wershler, (members Simpson School Nature Club) and Jim Allen, Brother Clarence, Dr. C. J. Houston, Dr. S. C. Houston, C. Stuart Houston, Brother Vincent (Yorkton Natural History Society).

Crescent, B.C.—(parts of coast and bush between Crescent, Ocean Park and White Rock, including White Rock pier and Nicomekl River). — Dec. 30, 1949; 8.30 a.m. to 4 p.m.; wind S.E. changing to N.E. with some snow; visibility poor; temp. 30°F.; 2 observers, one party; 15 miles by car and on foot. Common Loon, 4; Red-necked Grebe, 3; Horned Grebe, 21; Western Grebe, 5; Double-crested Cormorant, 3; Pelagic Cormorant, 2; Great Blue Heron, 1; Black Brant, 18; Canvas-back, 4; Greater Scaup Duck, 55; American Golden-eye, 35; Buffle-head, 23; Harlequin Duck, 22; White-Winged Scoter, 66; Surf Scoter, 56; American Scoter, 14; American Merganser, 13; Red-breasted Merganser, 3; Western Goshawk, 1; Ring-necked Pheasant, 2; Red-backed Sandpiper, 3; Glaucous-winged Gull, 67; Red-shafted Flicker, 5; Pileated Woodpecker, 2; Downy Woodpecker, 1; Northwestern Crow, 50; Black-capped Chickadee, 20; Winter Wren, 1; Bewick's Wren, 1; Varied Thrush, 1; Golden-crowned Kinglet, 12; English Sparrow, 26; Purple Finch, 25; Pine Siskin, 50; Spotted Towhee, 6; Oregon Junco, 36; Song Sparrow, 10. Total, 37 species, 647 individuals. — M. W. Holdom, E. E. Woodford.

Vancouver, B.C.—Dec. 26, 1949; cloudy, S.E. breeze, freezing at start; thawing, some fog in low areas at finish; some snow lying in sheltered places; 6 observers; distance covered, 5 miles; continuation of hunting season probably contributed to scarcity of waterfowl. Common Loon, 2; Pacific Loon, 1; Western Grebe, 13; Double-crested Cormorant, 17; Great Blue Heron, 1; Mallard, 6; Greater Scaup Duck, 16; American Golden-eye, 10; Buffle-head, 1; Red-breasted Merganser, 1; Sharp-skinned Hawk, 1; Ring-necked Pheasant, 9; Wilson's Snipe, 7; Glaucous-winged Gull, 300; Ring-billed Gull, 87; Screech Owl, 3; Red-shafted Flicker, 6; Downy Woodpecker, 3; Northwestern Crow, 6; Oregon Chickadee, 11; Winter Wren, 1; Robin, 40; Golden-crowned Kinglet, 30; Crested Mynah, 3; Western Meadowlark, 2; Brewer's Blackbird, 2; California Purple Finch, 510; Pine Siskin, 250; Oregon Towhee, 41; Oregon Junco, 75; Song Sparrow, 56. Total, 31 species, 1510 individuals. — Mrs. E. Bisney, Billy Bisney, E. Church, Wm. H. Hughs, W. Peters, F. Sanford. (Vancouver Natural History Society).

New Westminster, B.C.—(Pasture, hedgerows, brushy bogland, woods, river margin, sewer outfall and open river, adjacent to Fraser River). — Dec. 26, 1949; 10.00 a.m., to 3.00 p.m.; overcast, misty; extreme visibility one quarter mile; five miles on foot, two miles by car; two observers. Western Grebe, 1; Mallard, 2; Scaup Duck, 150; Cooper's Hawk, 1; Herring Gull, 8; Western Gull, 40; Glaucous-winged Gull, 45; Heerman's Gull, 10; Short-billed Bull, 30; Gull sp., 81; Northwest Flicker, 2; Gairdner's Downy Woodpecker, 5; Northwest Crow, 7; Oregon Chickadee, 84; Chestnut-backed Chickadee, 2; Coast Bush Tit, 26; Seattle Wren, 2; English Sparrow, 25 (est.); Oregon Towhee, 19; Oregon Junco, 40; Pine Siskin, 250 (est).; Puget Sound Sparrow, 3; Rusty Song Sparrow, 3. Total, 23 species or subspecies, 879 individuals. — W. S. Maguire, Harry Middleton.

Courtenay — Comox, Vancouver Island, B.C. — (Same area as covered for several years: through Courtenay and around river there, along river and shore line to and through Comox Village). — Dec. 26, 1949; 8.30 a.m. to 5 p.m.; overcast, calm, good visibility, temp. 29° to 38°F.; ground covered with snow for over a week; two observers, mainly on foot and together; 8 miles. Common Loon, 6; Red-throated Loon, 5; Holboell's Grebe, 6; Horned Grebe, 7; Western Grebe, 8; Pied-billed Grebe, 1; Double-crested Cormorant, 7; Pelagic Cormorant, 2; (unidentified cormorants, 10); Northwestern Coast Heron, 5; Mallard, 160 plus; Baldpate, 60; Pintail, 1; Shoveller, 2; Canvas-back, 6; Greater Scaup, 250 est.; American Golden-eye, 190 plus; Barrow's Golden-eye, 3; Buffle-head, 50 (est.); White-winged Scoter, 190 plus; Surf Scoter, 50 plus; American Scoter,

7; Ruddy Duck, 1; Hooded Merganser, 5; American Merganser, 7; Red-breasted Merganser, 4; 1000 plus unidentified ducks at sea; Red-tailed Hawk, 1; Sparrow Hawk, 1; Oregon Ruffed Grouse, 3; California Quail, 11; Ring-necked Pheasant, 6; Coot, 33; Killdeer, 7; Glaucous-winged Gull, 570; Herring Gull, 1; Thayer's Gull, 15; California Gull, 1 (R.F.); Ring-billed Gull, 1 (RF.); Short-billed Gull, 11; California Murre, 1; Flicker, 3; Pileated Woodpecker, 1; Harris's Woodpecker, 2; Gairdner's Woodpecker, 2; Raven, 5; Western Crow, 4; Northwestern Crow, 175 plus; Chestnut-backed Chickadee, 1; Seattle Wren, 2; Robin, 1; Golden-crowned Kinglet, 3; English Sparrow, 49; Meadowlark, 4; Purple Finch, 20 plus; Pine Siskin, 70 plus; Bendire's Crossbill, 4; Oregon Towhee, 6; Oregon Junco, 61; Fox Sparrow, 1; Song Sparrow, 7. Total, 59 species, 3124 plus individuals. (This is the first record on a Christmas census of Pintail, Ruddy Duck, California Gull, Ring-billed Gull and Sparrow Hawk). — Ralph Fryer, Theed Pearse.

OBSERVATIONS OF RUFFED GROUSE IN SOUTHERN ONTARIO WITH A DISCUSSION ON CYCLES [1]

A. MURRAY FALLIS [2] and C. E. HOPE [3]

THE OBSERVATIONS recorded below were made for the most part in isolated woodlots in the township of Albion, Peel County, Ontario. The woodlots consisted of mixed stands of deciduous trees, maple and beech predominating, and a mixture of hemlock and cedar. Small spring streams flowed through most of the woodlots. Most readers will be familiar with the extensive observations and studies on ruffed grouse in New York State by Edminster and others(4) so that further reference will not be made to them in this report.

NESTING

The number of eggs laid may be an important factor in grouse populations. In thirteen nests observed during 1944, 1945, 1946 and 1947, a total of 159 eggs was tallied which gives an arithmetic average of 12.2 per nest. Fisher (6) found an average of 10.6 in nine nests and states that Bump gave eleven as the average clutch in more than one thousand nests observed.

A single, somewhat impromptu experiment was carried out to determine the effect of removing eggs from a nest during the laying period. The eggs were removed after seven had been laid and three hen's eggs were put in their place. The nest was visited four days later, by which time three more eggs had been laid. These were removed. Four days later there were four more eggs in the nest and incubation had begun. These eggs were removed and no more eggs were laid subsequently. The grouse continued to sit on the hen's eggs for two weeks at which time she was taken as a specimen. It seems obvious that the hen's eggs served to hold the grouse to the nest which might otherwise have been abandoned. The total of fourteen eggs laid in this nest did not exceed the maximum of fifteen eggs found in any one nest during the period of our observations and therefore the total seems unaffected by egg removal.

Our observations suggest that second nestings following the destruction of first clutches which were in the process of incubation, are rare. In the eleven instances in which some agency had destroyed the eggs of a first nesting, neither a second nest was found nor were nestlings observed subsequently in the respective woodlots.

TEMPERATURE AND EGG LAYING

It is apparent from Table 1 that egg laying or incubation, or both, do not begin at a uniform time each year. The differences appear to be related to weather conditions, especially temperature. The snow had almost completely disappeared everywhere by April 1st in 1945 and 1946; in contrast with this the winter snows remained in the swamps until the latter part of April, during the spring of 1944 and 1947 and consequently few nesting sites were available for the grouse in

1) Received for publication May 30, 1949.
2) Ontario Research Foundation.
3) Royal Ontario Museum of Zoology.

TABLE 1. — SUMMARY OF GROUSE DRUMMING AND HATCHING IN PALGRAVE AREA.

Year	First Drumming	Eggs Hatching
1944	April 25	June 3-13
1945	April 1	May 18-24
1946	April 6	May 26-31
1947	April 22	June 1-7
1948	April 2	May 28 - June 3

TABLE 2. — MEAN TEMPERATURE °F FOR 10 DAY INTERVALS (FROM MAR. 10 - MAY 8) FROM WEATHER STATION AT BEETON, ONTARIO.

	1944	1945	1946	1947	1948
March 10 - 19	24.1	42.2	39.5	24.1	26.6
March 20 - 29	29.8	50.2	46.5	27.5	39.9
March 30 - April 8	31.0	46.7	40.6	32.6	42.6
April 9 - 18	36.7	54.0	39.4	39.6	42.4
April 19 - 28	44.6	40.6	47.8	41.1	52.9
April 28 - May 8	55.4	44.3	46.7	47.9	48.7

1944 and 1947 before the latter part of April. occurred after egg laying had begun and before incubation commenced.

The spring of 1948 was rather intermediate between these two extremes. If gonad development in certain migrating birds (Rowan, 10) is related to the increasing length of day it might be expected that mating behaviour in grouse would occur about the same time each year. However it appears from an examination of the temperature data (Table 2) and cloudiness records taken at a nearby weather station in different years at nesting time, that the initiation of drumming, egg laying and incubation may be affected more by temperature than by light, although drumming is known to occur after the incubation period is over. In fact, Mr. H. Holmberg informs us that he heard grouse drumming in mid-winter 1947-1948 in Algonquin Park.

The rate of growth of grouse populations may be affected by the percentage hatch of the eggs which in turn may be affected by temperature. Fisher (6) gives the percentage hatch for eighty-five eggs as 90%. We observed a hatch of over 90% in 1947 and an approximate 50% hatch in seventy-three eggs in 1945. However egg mortality in 1945 was apparently increased by cold weather as frost and snow

NESTS AND PREDATORS

The destruction of nests by predators may affect the rate of increase of a grouse population. Such destruction is probably determined by several factors such as the number of predators plus the availability to them of other acceptable food animals, and the adequacy of cover for the grouse. Clarke (3), in his extensive study of grouse, found only a single nest destroyed by predators, whereas fourteen out of twenty-three nests observed by us were, or were judged to have been, destroyed by predators. Eleven of the fourteen nests were destroyed after they had been visited by man, although not necessarily after the first visit; three were found destroyed, although so far as known they had never been visited by man; nine were visited some several times but were not destroyed. It is probable that the figure for those destroyed but not visited should be much higher as the chances of finding a nest with a bird sitting on it are much better than

that of finding a destroyed nest. It is apparent, therefore, that twelve nests were not affected by the trails which the authors made to them as three were destroyed before they were discovered and nine were not destroyed after being visited. This suggests that destruction of grouse nests is not necessarily increased because of a trail made by man to the nests. It is our opinion, also, although substantiating data are insufficient, that predation is more likely to occur just after incubation has commenced rather than before this time or later in the incubation period. Presumably foxes or skunks were the cause of most of the nest destruction observed by us.

WINTER MORTALITY

Few figures on winter mortality of adults are available from the present study. While looking for grouse nests, in the spring of 1946 the remains of seven grouse were encountered in the woods whereas in 1947 in approximately the same number of man hours spent in similar woods, no remains of grouse were found.

OTHER FACTORS AFFECTING GROUSE POPULATIONS

Mortality due to hunting might be thought important in causing declines in grouse populations. Fisher (6) concluded from studies in Michigan that the yearly kill by hunters in that state is a minor factor in the decimation of grouse populations as compared with other factors. It is common knowledge that declines in population occur in parts of the country which are rarely, if ever, hunted.

The rate of increase of grouse populations will be influenced also by the ratio of the sexes, especially if monogamy, rather than polygamy, is the rule. Bump (2) places the sex ratio for grouse in New York State as about equal although he states there may be a slight excess of males. It appears from our observations on raising grouse in captivity that males may be reared to adults more easily than females as ten out of fifteen so reared have been males. However, more information on the sex ratio in nature, together with data on the mortality of the sexes, is desirable. An examination of hunters' bags to determine the percentage of males and females should yield useful information. Clarke (3) believes there may be occasional polygamy and Snyder (11) suggest polygamy may occur. Allen (1) found a ratio of five hens to one cock was sufficient for breeding grouse in captivity. We found in one instance three nests within 100 yards of each other and two of these were less than 100 feet apart. It seemed unlikely that more than two males were in this territory.

It is conceivable that decline of grouse populations is caused by disease. Clarke (3) found *Leucocytozoon bonasae* to be abundant in young grouse at the time they were "dying off" and thought possibly this was responsible for the decline. *Leucocytozoon bonasae* might be expected to be pathogenic as Wickware (12), O'Roke (8), Huff (7) and others have observed that a species related to it is pathogenic to ducks. We found that 20% of thirty experimental ducks died, presumably as a result of the infection with the latter species. We also found that one out of nine crows infected with *L. sakharoffi* died presumably as a result of the infection. *L. bonasae* has been found in approximately 60-70% of over 100 adult grouse examined in Ontario (Fallis (5)), but whilst infection has been followed from the beginning in three ruffed grouse, no pathogenic effects have been observed. A heavy infection of *Haemoproteus* was observed in one grouse in which 30% of the red blood cells were parasitized.

DISCUSSION

It is generally conceded that rather pronounced "crashes" occur in the grouse population. Reports of Clarke (3) and Fallis (5) based on replies to questionnaires suggest that these occur at rather regular intervals of 9 to 10 years throughout the Province, although the cycle did not coincide exactly for all parts of the country. However, in the light of further experience it seems that a great number of quantitative observations are needed in more localities over a period of years to confirm the existence of any regular cycle. *A priori* it would seem to us unlikely that any such regularity occurs for reasons outlined below. Clarke, in his extensive work noted differences of two to three years in the period of peak abundance and decline in different parts of the of the Province. If this is the case the cycle would be immediately out of phase. If natural factors operate to bring the cycle back into phase there is no reason to suppose that they do not operate to create the opposite condition.

The sudden depletion of grouse in an area suggests that disease may be responsible for the "crash" and if this is so it might be expected that the sudden decline would occur

only when a certain density of population occurs. A number of factors may tend to prevent this build-up occurring with uniformity except in a local area.

Firstly, the rate of spread of disease would depend on a number of factors such as population density, predisposing causes, host resistance, mode of spread and incubation period. If transmission is direct the spread might be reasonably uniform. If, on the other hand, an insect vector of a disease is involved it introduces another series of variables. It is consequently inconceivable how any insect borne disease can spread among grouse with the same uniformity throughout widely scattered parts of the country at the same time.

Secondly an increase would not be expected as rapidly in a "hunted" as compared to a "non-hunted" area.

Thirdly, our observations suggest that the population may be affected by predators. A discussion of this aspect involves a consideration of complicated interlocking food chains, as it is necessary to consider not only the animals which prey on the grouse, young and old, but also availability of other foods and disease among the predators; in addition the number of predators will be affected by the number of their enemies. In addition it seems obvious from our limited observations that the grouse population may be affected by adverse weather conditions. The possibility of variations in weather throughout the country are such as to interfere with any regular cycle of population that otherwise might be expected.

The questions of sex ratio, differential mortality, and polygamy are also important in considering the rise and fall of grouse populations.

In view of the number of factors which may affect the grouse population it seems impossible to expect any regular cyclical phenomena in a widespread area at the same time. This throws some doubt on the further usefulness of compiling questionnaire data simply on population trends each year. Rather should we not endeavour to obtain information annually on the number of male and female grouse taken in hunters' bags, the number of drumming males in the spring, the number and size of broods in the early summer, and the number of predators together with information on disease and parasitism from a large number of localities? Admittedly this is a difficult programme to accomplish since the determination of certain points would seem to require biologically trained observers over a wide area and for a long period of time.

ACKNOWLEDGEMENTS

We are indebted to Dr. H. B. Speakman, Director, Ontario Research Foundation and Professor J. R. Dymond, Director, Royal Ontario Museum of Zoology, for permission to carry out this co-operative work and publish our observations. We are grateful also to Miss Maynard Grange, Librarian, Ontario Research Foundation and Mr. L. L. Snyder, Assistant Director, Royal Ontario Museum of Zoology, for reading the manuscript and making helpful suggestions.

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SOME HERPETOLOGICAL RECORDS FROM THE QUETICO PROVINCIAL PARK OF ONTARIO[1,2]

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DURING THE SUMMER of 1935, the author and R. V. Drexler travelled by canoe through the Quetico Provincial Park and adjoining regions of southwestern Ontario. Amphibians and reptiles were collected from a limited number of locations but it is felt important to report them because the fauna of this interesting area is not well known. Identification of material collected was checked at the Museum of Zoology, University of Michigan, and the specimens are deposited there, numbers 89534-55.

The region is located in the eastern portion of the Rainy River district and the western part of the Thunder Bay region, all within the Hudson Bay drainage system. The trip started at Ely, Minnesota, and described a large figure eight with the most northerly point at Savanne, Ontario. A short itinerary of the trip may aid in locating the collecting stations. The following lakes were visited in turn: from Basswood northeast to Agnes and Kawnipi, northwest to Russell, and north to Sturgeon and Doré; thence to Pickerel, east to French, north to Eva, east to Nydia and Elbow, north to Crooked and Mercutio, east to Bedivere and up the north arm to Lac des Mille Lacs, the most northerly lake visited. From the southeast end of Mille Lacs we travelled south through Kashabowie, southwest through Upper Shebandowan, Burchell and Snodgrass; then down the Wawiag River turning south just inside the park boundary to Mack Lake. From Mack we returned to the Wawiag and continued southwest to Kawa Bay of Kawnipi and retraced our course almost to Shelly, finally turning south to Cairn, Sark, Keefer, Kahshahpiwi to end the journey in Ranger Bay of Basswood Lake. All of the names used are taken from the Quetico Sheet No. 52B, of the National Topographic Series, of the Canadian Department of Interior dated August 1931.

[1]) Received for publication July 11, 1949.
[2]) Contribution No. 28 from the Biological Science Department of Michigan State College, East Lansing, Mich.

LIST OF SPECIES

1. *Ambystoma jeffersonianum.* Jefferson's salamander. — Near Agnes Lake. About a hundred logs were turned over and only two specimens were found under one; another was found near Russell Lake.

2. *Plethodon cincreus.* Red-backed Salamander. — Seven specimens were collected from three locations near Agnes Lake, and two near Kahshahpiwi Lake. Breeding was evidently in progress by June 20 since the Agnes specimens include a male, female and cluster of eggs collected under the same log.

3. *Bufo americanus americanus.* American Toad. — Three adults collected near Anubis, young were also seen June 23; two taken near Russell. This toad was observed also near Basswood, Meadows, north end of McKenzie Bay of Kawnipi, Cache, Pickerel, and French Lakes.

4. *Hyla crucifer.* Spring Peeper. — Two specimens were collected near Mack Lake and one at each near Pickerel, Eva, Doré, and Russell Lakes.

5.—*Rana septentrionalis.* Mink Frog. — One taken near Kahshahpiwi Lake.

6. *Rana clamitans.* Green Frog. — One collected near each, south and west shores of Kawnipi, Elbow, and Sark Lakes.

7. *Rana pipiens.* Leopard Frog. — Three specimens were collected near north end of McKenzie Bay of Kawnipi. Others were seen at Cache, Pickerel, and French Lakes.

8. *Rana sylvatica catabrigensis.* Wood Frog. — Four were collected from three localities near Agnes. Others were seen at Basswood, Meadows, Anubis, Kawnipi, Cache, Russell, Doré and Pickerel Lakes.

9. *Chelydra serpentina.* Snapping Turtle. —Identified from photographs taken at Sturgeon Lake by rangers stationed there.

10. *Chrysemys sp.* Painted Turtle. — Seen at Meadows Lake. Resembled *picta bellii* in that markings followed well out on the plastron.

11. *Thamnophis sirtalis sirtalis.* Garter Snake. — One collected near Agnes and another near the north end of McKenzie Bay of Kawnipi Lakes.

SOME COUNTS OF BIRD POPULATIONS IN CONIFEROUS FORESTS NEAR THE LIMIT OF TREES [1]

LEONARD W. WING

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THE COUNTS that supply the base for this paper were obtained during some studies of bird activity in the Arctic (by means of a grant from the Arctic Institute of North America). Owing to the advance of the breeding season, it was not feasible to set up regular check plots for counts of bird populations along Teslin River, near Johnson's Crossing, Yukon Territory in the summer of 1948. Instead, I contented myself with making several transects at I had time available from other field work. There are so few counts of actual populations in the Northland, that these seem of especial significance as indicating the very low order of abundance near the conifer fringe. The transects themselves varied from one to seven miles in length over substantially the same route each time. I kept a record of each individual bird and group as seen, along with the distance at which it was first detected. This *detection-distance* is the distance between the bird and me at the moment of finding it.

I average the respective detection-distances and have used this average as the width of the strip along each side of the transect line in which birds were counted. The length of the travel line and the strip width along each side gives the area covered by this type of census. For comparative purposes, I converted all to a 100-acre basis. The number of birds per hundred acres for nine transect counts varied from a low of 1.3 to a high of 13.0 in the

1) Received for publication November 22, 1949.

TABLE 1. BIRD POPULATIONS — LODGEPOLE PINE TYPE

Date	Hours	Number of Species	Average Flock Size	Average Detection Distance (Yards)	Miles of Transect	Birds per Hundred Acres
June 30	9:00 AM to 1:00 P.M.	10	1.5	110.0	2.5	13.0
July 4	3:00 PM to 6:00 PM	7	1.6	108.2	3	3.5
July 6		5	1.0	145.0	5	1.3
July 7		3	1.0	90.0	1	4.6
July 9	7:30 AM to 2:30 PM	16	1.3	76.7	7	10.0
July 13	9:00 AM to Noon	5	1.6	56.0	3	6.5
July 14	9:00 AM to Noon	8	1.1	192.5	2.5	3.2
July 15	9:00 AM to Noon	4	1.8	100.0	3	4.1
July 16		3	1.3	93.3	1.5	4.0
	Total miles				28.5	
	Average		1.3	103.1		5.2
	SPRUCE TYPE					
July 23	9:00 AM to Noon	3	3.7	83.3	3	6.5
July 25	8:00 AM to Noon	3	9.0	106.2	5	9.3
July 26	9:00 AM to Noon	6	2.3	140.0	4	3.4
	Total miles				12	
	Average		4.7	124.2		5.6

lodgepole pine type (see table 1). It averaged 5.2. In the spruce type, the transects gave 3.4, 6.5 and 9.3 for three transects, respectively; they averaged 5.6.

An observer must necessarily assume that he detects all or most of the birds within the detection strip. This is a problem involved in all animal censuses also. The important point, however, is not the exactness of the estimate by the transect censuses but rather the low order of population indicated for this northern conifer limit. This population thus indicated is far lower than any that I have found reported elsewhere, but all such counts are from hundreds of miles farther South. The total approaches that along the ponderosa pine-grassland border or even of some desert areas.

A noticeable trait of birds in the region, and perhaps elsewhere in the Arctic and other places, is their appearance in local concentrations that I have called "pocketing". Pockets occur in parts of the vegetation type seemingly uniform throughout, for I could find no readily apparent differences between pockets and the places between. Pockets occur also in favorable places where habitat variation throws many birds together. Pocketing in the woods impresses itself upon one as he walks for perhaps a mile or two without finding a bird and then passes through a spot inhabited by a number of birds of several species.

The presence in the following tabulation of several birds of long-range detection, such as the Nighthawk, influences the final figures as well as the detection-distance averages. But this a relative matter and does not materially change the indications of very low level populations in the northern coniferous forest fringe.

The larger flock average for the spruce type resulted from the later dates and consequent presence of family groups and birds gathered together as a prelude to flocking for migration.

REVIEW

An unusual Maskinonge from Little Vermilion Lake, Ontario. *By G. S. Cameron. Contributions of the Royal Ontario Museum of Zoology No. 31, 1948. Reprinted from the Canadian Journal of Research, D, 26:223-229, October, 1948.*

In the October 1945 issue of "Outdoors", J. Godfrey Jr., reported an unusual type of maskinonge from Little Vermilion Lake, Ontario, which was described as a new species, *Esox amentus*. In connection with the taxonomic study of maskinonge conducted by the Royal Ontario Museum of Zoology a study of the maskinonge of the area was conducted during the summer of 1946 with the financial support of the Carling Conservation Club. The results of this study are reported in the paper under review.

During the study, 69 maskinonge from Little Vermilion Lake and a connecting lake were examined in detail (28 measurements, counts of scales, branchiostegal and fin rays). Six of the maskinonge were significantly different from the remaining 63 in many of the observed characters including the presence of the distinct dark cross-bars on the body which have resulted in the name "true tiger" being applied to this type.

Pike (*Esox lucius*) although not reported from Little Vermilion Lake are abundant in a neighbouring lake which is joined to Little Vermilion Lake by a long meandering stream.

A consideration of the characters of the "true-tiger" maskinonge in relation to those of the maskinonge and pike indicates that the form is a hybrid between these two species. This conclusion is strengthened by the fact that the "tiger" type fish are relatively rare, appear to be sterile, and have many characters like one or other parent or intermediate between those of the parent species. Hybrids between these two species have been reported by other authors. These were similar in some characteristics, including barring, to the specimens secured from Little Vermilion Lake.

A map of the area, a table comparing some 32 characters of the hybrid with the common maskinonge, three graphs, four excellent photographs of specimens and a brief bibliography complete this interesting paper. — **Victor E. F. Solman.**

OTTAWA FIELD-NATURALISTS' CLUB BY-LAWS

(Revised 1949; approved by Council December 9, 1949)

1. **Standing Committees.** Three standing committees of at least five members each, of whom a majority in each committee shall be members of the Council, shall be appointed by the Council, namely: a Publications Committee, an Excursions and Lectures Committee, and a Reserve Fund Committee. The Editor, the Treasurer, and the Business Manager shall each be, ex-officio, member of the Publications Committee.

The Chairman of the Excursions and Lectures Committee shall have power to add to the Committee, provided that the majority of the Committee shall at all times be members of the Council.

2. **Duties of the Publications Committee.** The Publications Committee shall have direct supervision over all publications issued or received by the Club. The Committee shall have power to decide what shall and what shall not be published in the Canadian Field-Naturalist and shall see that the Editor performs his duties in accordance with the Constitution and By-laws.

The Chairman of the Committee shall submit to the Council a report which shall be embodied in the Annual Report of the Council. This report shall give an outline of the work accomplished by the Committee during the year.

3. **Duties of the Editor.** The Editor shall be responsible for the preparation of the Canadian Field-Naturalist. He shall be, ex-officio, a member of the Publications Committee, whose executive officer he shall be and to whom he shall be responsible. He shall be Chairman of the Editorial Committee, composed of the Editor and the Associate Editors.

4. **Duties of the Associate Editors.** The Associate Editors shall co-operate with the Editor in his work of preparing the Canadian Field-Naturalist.

5. **Duties of the Business Manager.** The Business Manager shall be responsible, under the direction of the Publications Committee, for the custody and sale of the publications owned by the Club; for the management of the circulation and for the sale of advertising for The Canadian Field-Naturalist.

6. **Duties of the Excursions and Lectures Committee.** The Excursions and Lectures Committee shall make arrangements for field excursions and for lecture programmes, subject to the approval of the Council. The Chairman of this committee shall submit a signed report to the Council at the close of each year outlining the activities carried out under the supervision of this committee. This report shall be embodied in the Annual Report of the Council.

7. **Duties of The Reserve Fund Committee.** The Reserve Fund Committee shall serve in an advisory capacity to the Treasurer in the matter of investment of the Reserve Fund.

8. **Groups.** The Council may authorize the formation of groups for study in any field of natural history.

9. **Fees.** The schedule of Annual Fees shall be as follows:

Active Members: Three Dollars
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Fees become due at the beginning of each calendar year and no member in arrears shall be entitled to the privileges of the Club.

10. **Order of Business at Meetings of the Council.**

1. Reading of the minutes of the previous meeting.
2. Business arising out of the minutes.
3. Communications.
4. New members.
5. Finances.
6. Reports of committees.
7. New business.

11. **Amendments.** An amendment to these By-laws may be adopted at any meeting of the Council, by a three-quarter vote of the members present, due notice embodying a copy of the proposed amendment having been given at a previous meeting of the Council. Any such amendment shall be published in an early issue of the Canadian Field-Naturalist.

PLANTS COLLECTED BY B. JOHN WOODRUFF ON THE WEST COAST OF MELVILLE PENINSULA, FRANKLIN DISTRICT, N.W.T., CANADA. [1, 2]

W. J. CODY

Division of Botany and Plant Pathology, Science Service, Department of Agriculture, Ottawa, Canada.

DURING THE SUMMER of 1948 (Aug. 16 to 20) Mr. B. John Woodruff of the Geodetic Survey of Canada made a collection of plants from the west coast of Melville Peninsula, Franklin District, N.W.T. (68°18'N, 85°25'W). Since relatively little is known of the vegetation of Melville Peninsula, particularly of the west coast, it seems fit to publish a list of the species represented in the collection.

The following description of the area (see Fig. 1) has been provided by Mr. Woodruff:

The camp site was on a sandy beach on the south shore of a small lake about two miles in length and a mile in width, on the mid-west side of Melville Peninsula. The lake was drained by a small stream, which dropped about 20 feet in its 100 yard course to sea level at Committee Bay. To the south of the camp was a 20 to 30 foot bank of gravel containing numerous sea shells and a buried whale skeleton, indicating an old sea shore about twenty feet above the present lake level. The old sea bed maintained a sedge meadow, where there were many signs of cariboo. There were two marshy areas on either side of the camp site. The surrounding land mass consisted of glaciated igneous rock that rose 500 to 1000 feet above sea level. The folds and valleys were filled with glacial till and, in sheltered moist areas, the soil supported a fair growth of vegetation. The exposed land was swept almost bare by the wind, although scattered clumps of mosses and lichens maintained a foothold.

The following specimens have been identified by members of the staff of the Division of Botany and Plant Pathology, Department of Agriculture, Ottawa, and are preserved in the herbarium of that institution:

Hierochloë alpina (Sw.) R. & S.—sand beach; *17.*

Alopecurus alpinus J. E. Sm. — swamp and sand beach; *29.*

Arctagrostis latifolia (R. Br.) Griseb. — marsh; *30.*

Trisetum spicatum (L.) Richt.—scattered in small clumps on sandy bank and on sand beach; *11, 15.*

Pleuropogon Sabinei R. Br. — in running water; *42B.*

Poa arctica R. Br. — common in clumps on sand bank; *13* (det. J. R. Swallen, U.S. National Herbarium, Washington).

Dupontia Fisheri R. Br. var. *aristata* Malte ex Polunin — in stream; *42A.*

Puccinellia paupercula (Holm) Fern. & Weath; *26* (det. J. R. Swallen).

Puccinellia Vahliana (Liebm.) Scribn. & Merr.; *27* (det. J .R. Swallen).

Festuca brachyphylla Schultes—moist sandy beach; *6.*

Eriophorum angustifolium Honckn. — marsh; *31.*

Carex nardina Fries — in clumps on sand beach; *24.*

Carex Bigelowii Torr. — common, in clumps, on moist sandy beach; *4.*

Carex aquatilis Wahl. — swamp; *28.*

Carex membranacea Hook. — moist gravel; *44.*

Luzula nivalis (Laest.) Beurl. — crack in rock; *37.*

Luzula confusa Lindeb. — scattered on moist sandy beach; *1.*

Juncus biglumis L. — moist sand beach; *33A.*

Juncus albescens (Lange) Fern.—moist sand beach; *33C.*

Juncus castaneus J. E. Sm. — moist sand beach; *33B.*

Salix arctica Pall. var. *Brownei* Anders; *35.*

Salix herbacea L.—prostrate on moist creek bank; *34.*

Oxyria digyna (L.) Hill — scattered on moist sandy bank; *7.*

1) Contribution No. 1003 Division of Botany and Plant Pathology, Science Service, Department of Agriculture, Ottawa, Canada.

2) Received for publication December 27, 1949.

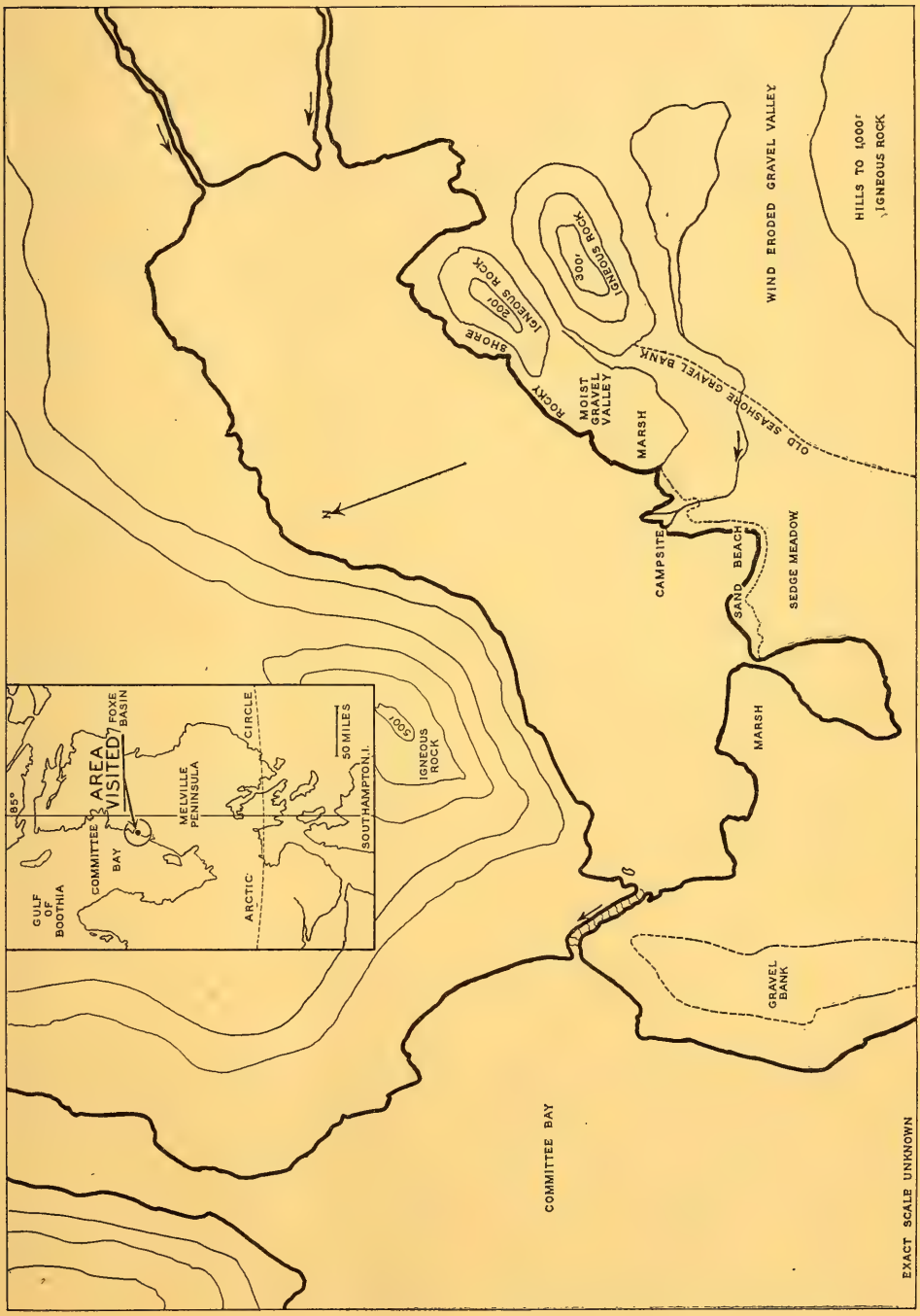

Fig. 1. Map of collecting site on west coast of Melville Peninsula.

Silene acaulis L. var. *exscapa* (All.) DC. — common; in clumps on moist sand beach; *5.*

Cerastium alpinum L. — fairly common; scattered on sand bank; *14.*

Stellaria laeta Rich. *(Stellaria longipes sensu* Polunin, *pro parte,* Bot. East. Can. Arctic, Part 1, Canada, Department of Mines and Resources, National Museum Bulletin No. 92, 1940). — moist rocky area; *39.*

Papaver radicatum Rottb. — moist sandy beach; *2.*

Cochlearia officinalis L. var. *arctica* (Schlecht.) Gelert — prostrate on sand beach; *12.*

Eutrema Edwardsii R. Br. moist plain; *23.*

Draba fladnizensis Wulfen — sand beach; *19, 20B.*

Draba nivalis Lil. — sand beach; *20A.*

Arabis arenicola (Rich.) Gelert — prostrate on sand beach; *21.*

Saxifraga cernua L.—scattered on moist sand bank; *9.*

Saxifraga stellaris L. var. *comosa* Retz. — scattered on moist sand bank; *10.*

Saxifraga tricuspidata Rottb. forma **Woodruffii** J. A. Calder, forma nov. — laxissime caespitosa caudiculis elongatis; folia fere omnia integra; caules floriferi breves uniflori simplices; petala lutea (epunctata?).

TYPE: Moist sheltered habitat among boulders along a rocky hillside, west coast of Melville Peninsula, Franklin District, N.W.T. 68°18'N, 85°25'W, *B. J. Woodruff 38,* Aug. 20, 1948. (DAO).

Although this form is represented by only a single collection, it is so strikingly different from the typical phase that it has been thought worthy of describing. It is readily distinguished by its more lax and prostrate form, its caudex with elongate branches, leaves more diffused along the branches, and the short, simple, single-flowered scapes 2—10 (—25) mm long. As in forma *subintegrifolia* Abrom., the majority of the leaves are subentire, lacking the lateral teeth. Since the collector stated that only a single colony was noted in the area, it is impossible to say whether this is simply an ecological form which may occur throughout the range, or whether it is varietally distinct with a restricted distribution. Until further collections have been made, it has been thought appropriate to give this entity the status of a form.

Saxifraga Hirculus L. — clump in marsh; *32.*

Saxifraga oppositifolia L. — prostrate clumps on moist sandy beach; *3.*

Dryas integrifolia Vahl — moist plain; *40.*

Astragalus alpinus L. — prostrate on moist rising ground; clay soil; *41.*

Oxytropis Maydelliana Trautv. — common; prostrate on sandy bank; *18.*

Epilobium latifolium L. — sand bank; 25.

Cassiope tetragona (L.) D. Don—dry rocky hillside; *36.*

Armeria maritima (Mill) Willd. var. *sibirica* (Turcz.) Lawr. *(Armeria maritima sensu* Polunin, *pro parte,* L.c.) — scattered on sand bank; *16.*

Antennaria Ekmaniana A. E. Porsild — on moist plain; *22.*

NOTES AND OBSERVATIONS

An Albino Mud Puppy near Fort William, Ontario. — On May 7, 1949, Mr. Edward Hay, Fort William, presented me with two mud puppies (*Necturus maculosus* (Raf.)) which he had taken the previous evening while fishing with worms in Mosquito Creek, Neebing Township, near its confluence with the Kaministiquia River, outside the city of Fort William. The one was a male, typical in appearance and measuring 280 mm. in the preserved state. The second was an albino female which measures 204 mm. In life it was delicate pink in coloration but after preservation in ten percent formalin, assumed a dirty white appearance, the gills and borders of the tail being considerably darker. The dorsal surface shows a suggestion of small pale grey spots where black spots typically occur in normal specimens. I have been unable to find a previous record of albinism in the mud puppy. It occurs of course in other amphibians and in reptiles and there is no reason why it should not also occur in this species.

The two mud puppies had been kept in a pail of water overnight and in the morning Mr. Hay stated several dead "young" were

present in the container. Unfortunately he had destroyed them. I presume they were small amphibians of the same or of another species which had been disgorged.

During the ten years spent in this region prior to 1948, salamanders were conspicuous by their scarcity. In addition to one or two records of mud puppies, I had seen a Jefferson's Salamander (*Ambystoma jeffersonianum*) (Green) taken locally in 1944. On May 1, 1941, Common Newts *Triturus viridescens* (Raf.)) were noted at Nishin Lake, 100 miles to the north-east, both in the water and in the stomach contents of Brook Trout (Salvelinus fontinalis (Mitchill)).

In the Fall of 1948, several Jefferson's Salamanders were taken in Port Arthur. This year (1949) one was taken at Lake Shebandowan, 50 miles west of the Lakehead, on June 26. On June 22, a Newt was caught at Nishin Lake, where I had observed the above specimens. Two Red-backed Salamanders (*Plethodon cinereus* (Green)) were captured in Pardee Township on June 19, and one in Paipoonge Township on August 28. These localities are 25 miles south and 20 miles south-west of Fort William. Several other mud puppies have also been taken this year by local fishermen. The increased number of records is probably due to an increasing interest in our wild life rather than due to an actual increase in the numbers of salamanders present. — A. E. ALLIN, Fort William, Ontario.

Migration of Black Swift. — A very large flight of Black Swift, *Nephoecetes niger borealis* (Kennerly), was seen at 9.30 o'clock on the morning of September 16, 1949, over the city of Vancouver, B.C. The weather was dull and showery. Temperature 50°F. and the wind was 20 mph. from the southeast.

At first two flocks of swifts could be seen moving in a southeastern direction and very high up. On looking at these birds through field glasses it was found that they were but a lower stratum of swifts and that there were great numbers higher up all migrating in the same direction; in fact the sky seemed full of swifts. It was quite impossible to estimate the number seen in this flight which lasted about six minutes and I do not think I saw the beginning, but there were many hundreds. Through the glasses the centre of the flock reminded me of a swarm of bees so great was the number. These swifts were not circling in the usual manner of flight, but were sailing or gliding in one direction and travelling very rapidly. The flight was somewhat broken towards the end with single individuals and groups of five or seven following close together.

It is known that the Black Swift nests in the high mountains about Kennedy Lake on Vancouver Island, but this colony could not possibly account for even a small proportion of the birds seen this morning as all were coming from a northwesterly direction which is the direction Kennedy Lake lies in relation to Vancouver.

Southbound flights of Black Swift have been seen at other times about Huntingdon which lies about fifty miles east of Vancouver. On September 8, 1934, about 350 swifts passed overhead during the morning, circling and drifting in a southerly direction. Small flights were also seen on Sept. 10 and 11 of the same year.

Flights of Black Swifts which might be termed feeding flights have been noticed on numerous occasions. On June 22, 1932, at 7 p.m. after a rainy morning, about 150 swifts were seen flying between 100 and 200 feet in the air near Huntingdon. After circling about for an hour they disappeared. The same number appeared the following day at the same hour and repeated the performance. On June 26, the flight again appeared, but this time at 7 a.m. and remained circling about until 12.30 p.m. The flights on June 25 and 26 both came from the south-east in which direction lies the Mount Baker range of mountains. — KENNETH RACEY, Vancouver, B.C.

A New Record for Palm Warbler. — On October 1, 1949, while collecting on the University of British Columbia campus, the unusual behavior of a warbler attracted my attention. I collected the bird, which proved to be a Palm Warbler (*Dendroica palmarum palmarum*). This appears to be the first record for Canada west of the Rockies and the second specimen collected in North America west of the Rockies.

Munro and Cowan, (B. C. Prov. Mus., Spec. Pub. No. 2, 1947, p. 195) state that the species is a summer visitant to the extreme

north-eastern portion of the province. Grinnell and Miller (Pac. Coast Avifauna, No. 27, 1944, p. 408) cite the species as accidental in California. One immature male was collected in Monterey County, October 9, 1896. A sight record was made in Imperial County on September 22, 1942.

The preserved specimen of this new record, a male, has been deposited in the Museum of Zoology, University of B. C. as number 2175. — **C. E. Law,** Dept. of Zoology, University of B. C.

Purple Sandpiper in Manitoba. — In the late afternoon of May 14, 1949, accompanied by three friends, equipped with prismatic field-glasses, I visited the southwest shore of Lake Winnipeg at Whytewold beach to look for birds on migration.

After watching for less than half an hour, we saw a purple sandpiper at a distance of twenty-five yards and watched it for at least ten minutes with the glasses. I pointed out to my friends the yellow legs, the orange colour at the base of the bill, the colour of the head, mantle and breast like the colour of a male slate-coloured junco; also when it flew the white wingbar and the stiff flight like that of a spotted sandpiper and, when it walked, its stooped crouching posture reminiscent of a sanderling. Unfortunately, I was not equipped to collect it.

I believe that this is the first record for the Province of Manitoba. A perusal of the literature, indicates that inland records are exceedingly scarce, apart from some large lakes in the Mackenzie River region. I used to be familiar with the purple sandpiper on the east coast of England but this is the first I have seen in North America.

L. T. S. NORRIS-ELYE,
Manitoba Museum, Winnipeg, Man.

The Blue Grosbeak in Western Ontario.— Standard reference books indicate that the blue grosbeak (*Guiraca caerulea*) is a southern bird. It may therefore be of interest to record the observation of a male in adult plumage at a small clearing on Cliff Lake about twenty-five miles north of Vermillion Bay, Ontario. The bird was seen in good light through 7 x 50 glasses in the early morning of June 25, 1949. There can be no doubt of its identity. The bird was not seen again during a two weeks' stay at this camp. Although I made daily observations, no unusual amount of time was devoted to searching for the bird.

C. S. MARVEL,
University of Illinois.

Migration of Western Grebe on British Columbia Coast. — The main migration, south, of the Western Grebe (*Aechmophorns occidentalis)* usually reaches this part of the east coast of Vancouver Island, about the middle of October so it seems worth recording that at least 1500 were seen at Oyster Bay (20 miles north of Comox) on September 7, 1949. These birds had all the appearance of recent arrivals resting after a long journey. The following day there was not one to be seen there. Other evidence of early migration, this year, was seeing six birds, also within a short distance of Oyster Bay, that were swimming in a southerly direction suggesting migration.

Oyster Bay would appear to be the resting place for these grebes on reaching the sea on their migration from, probably, their nesting grounds in British Columbia and possibly, farther east. About the middle of October is the date of their arrival and they will be there in thousands and, generally, have had the appearance of tired birds resting. As Oyster Bay is just south of the entrance to Bute Inlet, on the mainland of B.C., and which extends into the Coast range some fifty miles, this may be the route taken to and from their breeding grounds. I have never seen the Western Grebe in flocks, of anything like comparable size, north of Oyster Bay nor any suggestion that they travel north of there by sea, on migration.

The Western Grebe moves up this coast, in the Spring, in thousands, and, in support of the suggestion that these birds strike inland from Oyster Bay, on April 24, 1943, I noted there were "thousands" in the Bay all of which had disappeared by the evening of the same day. — **Theed Pearse,** Comox, V.I., B.C.

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Vol. 12,	No. 7 & 8,	Oct.-Nov.,	1898
Vol. 12,	No. 9,	Dec.,	1898

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Vol. 39,	No. 4	Apr.,	1925
Vol. 39,	No. 5,	May,	1925

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Mr. W. J. Cody,
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Vol. 64 MAY-JUNE, 1950 No. 3

The CANADIAN FIELD-NATURALIST

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AUG -2 1950
HARVARD UNIVERSITY

The Canadian Field-Naturalist

Vol. 64 OTTAWA, CANADA, MAY-JUNE, 1950 No. 3

BIRD NOTES FROM GREAT WHALE RIVER, QUE.[1]

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THE WRITER was engaged in botanical work at Great Whale River, Que., from 16 June to 10 September, 1949. Circumstances made it impossible to spend much time on bird study, particularly in June and July. The random data gathered were largely from chance observations made in the course of other field work. The notes given below should be read with this qualification in mind and should not be assumed to give a complete picture of the status of any species. The data are mainly from the writer's observations, but include a few observations from Mr. J. R. Vockeroth and Dr. D. W. Jenkins. Thanks are due to Mr. W. Earl Godfrey for advice and assistance in the preparation of this report.

The settlement of Great Whale River is situated at the mouth of the river of that name, at 55° 17'N, 77° 47'W. The country consists of strongly glaciated granite hills, mostly 200 to 600 feet high, with summits almost unvegetated, but with every cleft filled with thickets of willow, alder and dwarf birch. The valleys contain abundant black and white spruce and some tamarack wherever sufficient soil has accumulated. A narrow coastal strip is almost completely treeless largely because of abrasion by driving snow. An elevated delta of almost pure sand occupies each side of the river mouth and spreads intermittently up and down the coast for several miles. The shore is composed of extensive sand beaches broken by rocky headlands. Such a shore provided little attraction to most shore birds, but the variety of habitats to which the sand contributed compensated for this drawback.

Of 69 species seen, 39 occurred in summer. Most of the latter probably bred in the area, but a heavy work programme in July precluded the search for nests, and satisfactory proof of breeding was not often obtained. The spring migration was virtually over by mid June and the data for migrant species are, therefore, almost all for the fall.

ANNOTATED LIST OF SPECIES OBSERVED

1. **Common Loon**

Gavia immer.—Seen occasionally in June and July.

2. **Red-throated Loon**

Gavia stellata.—Seen regularly throughout the summer; fairly common.

3. **Canada Goose**

Branta canadensis. — Small strings seen 23, 24 and 29 June, and 27 Aug. and 7 Sept. We left before the main southward migration.

4. **Lesser Snow Goose**

Chen hyperborea hyperborea.—Frequent in small numbers from 24 Aug. onward. At least 95 on 5 Sept. Usually with blue goose and averaging about 10 per cent of the mixed strings. Juveniles seen 7 and 9 Sept.

5. **Blue Goose**

Chen caerulescens. — Abundant from 24 Aug. onward. Geese were reported two days earlier but were not seen by the writer and the species is in doubt. We were told that this year's migration started exceptionally early. It may have been hastened by a succession of strong northerly winds. Over 1150 seen in drizzle on 5 Sept., including a few juveniles and at least one snow-blue hybrid; several hundred more geese beyond range of positive determination. Of several hundred on 9 Sept., about 50 per cent were juveniles, and of about the same number on 10 Sept., over 50 per cent were juveniles.

[1] Received for publication December 14, 1949.

Vol. 64, No. 2, March-April, 1950, was issued April 27, 1950.

6. **Pintail**

Anas acuta tzitzihoa. — Seen frequently from 14 Aug. in small numbers. Often seen to fly up the river, suggesting that some migrants break away from the coast here and follow a river and lake course through central Quebec.

7. **American Golden-eye**

Bucephala clangula americana. — A few seen in June, July and September.

8. **Old-Squaw**

Clangula hyemalis. — One pair seen 22 June.

9. **White-Winged Scoter**

Melanitta fusca deglandi. — About 50 to 150 seen off shore with American scoters during last week of June. A few seen in July and September.

10. **American Scoter**

Oidemia nigra americana. — About 150 to 700 spent the last week of June just off shore with smaller numbers of white-winged scoters. They were apparently feeding at a mussel bed some half mile from shore, since many mussel shells wash ashore here. From the date these must have been non-breeding birds although adult males of each species could be discerned in some numbers. They disappeared abruptly at the beginning of July and very few were seen later in the season.

11. **Ruddy Duck**

Oxyura jamaicensis rubida. — A single dead female was found washed up on the shore on 19 June.

12. **Red-breasted Merganser**

Mergus serrator. — A recently picked partial skeleton was found on the shore on 25 June. About ten were seen on 30 June and one on 20 July.

13. **American Rough-legged Hawk**

Buteo lagopus s. johannis. — Several were seen 23 and 24 June and one on 2 August a few miles from the settlement. The latter bird called repeatedly with a powerful 'Kee-ee-ur' that started explosively and then dropped in pitch and volume; not such a squealing quality as in the calls of the red-shouldered and red-tailed hawks. From late August until we left one to nine birds were seen almost daily, usually soaring in the updraft over the river bank and often hovering. By starting to squeak when it was headed toward us from a distance of some 300 yards, one bird was attracted successfully and hovered some fifty feet over our heads for a minute or more. Although the species may breed in the area it is not surprising that it did not frequent the settlement during the summer when many natives are there. It would certainly be favoured as food and may well be disliked as a competitor for the food of fur bearers.

14. **Marsh Hawk**

Circus cyaneus hudsonius. — A female was seen repeatedly through the summer near the settlement and a male once; but no evidence of breeding was obtained, except that after mid August a second brown individual that might have been a juvenile was sometimes seen.

15. **Osprey**

Pandion haliaetus carolinensis. — A pair nested four miles up the river from the settlement on the platform made by the top of a fire-killed black spruce breaking off thirty feet from the ground. The nest was about three feet across. A pair, probably the same birds, occasionally fished at the river mouth.

16. **Peregrine Falcon**

Falco peregrinus anatum. — One each seen on 22 Aug. and 8 Sept.

17. **Eastern Pigeon Hawk**

Falco columbarius columbarius. — One, or occasionally two, seen at regular intervals during the summer. A female flushed on 13 July stayed close by, giving a repetitious rasping call, which suggested that it had young.

18. **Spruce Grouse**

Canachites canadensis. — Six seen in scattered locations. One flushed on 9 July stayed close repeatedly giving a low warning "kuk", but the young could not be found.

19. **Ungava Willow Ptarmigan**

Lagopus lagopus ungavus. — Seen occasionally in small numbers. Apparently breeding, as two seen showed injury feigning.

20. **Semipalmated Plover**

Charadrius hiaticula semipalmatus.—One seen on 22 June. One to 20 seen on 9 dates from 30 July to 6 Sept.

21. **Golden Plover**

Pluvialis dominica dominica. — Thirty-one in breeding plumage seen on 26 Aug.; several in varying plumage on 6 and 7 Sept.

22. **Black-bellied Plover**

Squatarola squatarola. — One seen on 4 Sept. and one on 7 Sept.; both in fall or juvenile plumage.

23. **Ruddy Turnstone**

Arenaria interpres morinella. — Four adults seen on 2 Sept. and two juveniles on 7 Sept.

24. **Hudsonian Curlew**

Numenius phaeopus hudsonicus. — On 9 July, three seen flying north. Eleven passed south and tracks of two others seen on beach 25 July. Several seen or heard on 28 July and one on 29 July. Not noted thereafter except for one each on 5 and 7 Sept.

25. **Spotted Sandpiper**

Actitis macularia. — The only shore bird proved to be breeding. Three nests seen along the river banks and birds noted regularly at several other points. Last seen on 30 Aug.

26. **Greater Yellow-legs**

Totanus melanoleucus. — One to four southbound birds seen or heard 24 July, 19, 21, 28 Aug. and 8 Sept. Four on 21 Aug. came down the coast and swung up the river as though to migrate inland. -(See under Pintail.)

27. **Knot**

Calidris canutus rufus. — One seen 24 August.

28. **Pectoral Sandpiper**

Erolia melanotos. — Thirteen seen on 6 Sept. and a few on 7 Sept., feeding in low mossy sand between old beach ridges or flying straight through.

29. **White-rumped Sandpiper**

Erolia fuscicollis. — One to 9 birds seen on five dates from 29 July to 9 Sept.

30. **Baird's Sandpiper**

Erolia bairdii.—Two to sixteen seen on six dates from 16 Aug. to 8 Sept. Most commonly flushed from grass near tent sites where insects may have been abundant.

31. **Least Sandpiper**

Erolia minutilla. — One to 8 or more seen on fourteen dates from 25 July to 9 Sept. These counts are probably considerably lower than they would have been if all 'peeps' had been identifiable; but in the absence of good feeding grounds they were usually seen in flight overhead when they could not be named unless they called. The apparent absence of any semipalmated sandpipers was surprising to the writer who expected them to be fully as common as the least on sandy shores.

32. **Red-backed Sandpiper**

Erolia alpina pacifica.—One seen 7 Sept. We presumably left too early for this species.

33. **Hudsonian Godwit**

Limosa haemastica. — On 4 Sept., the writer went out to the sand point at the river mouth in the late afternoon in a 30 m.p.h. southwest wind. By the greatest good fortune a single bird of this species passed within 20 feet a minute after the point was reached. Flying into the wind five feet above the surface at an estimated ground speed of 40 m.p.h. it afforded an excellent view. It was in fall or juvenile plumage; and, from the date, it was probably a juvenile. The deep, rather slow, driving wing beats gave an impression of great power. The species is probably less common on this coast than on the southwest coast of Hudson Bay where the main fall migration apparently occurs.

34. **Sanderling**

Crocethia alba.—Two to 73 seen on eight dates from 24 Aug. to 8 Sept. The one migrant shore bird that was really at home on the clean sand beaches.

35. **Glaucous Gull**

Larus hyperboreus hyperboreus. — One seen 18 June with herring gulls, presumably a late migrant.

36. **Kumlien's Gull (?)**

Larus leucopterus kumlieni. — A bird seen close to the river bank at the settlement on 25 Aug. might have been Kumlien's gull or Thayer's herring gull.

37. **Great Black-backed Gull**

Larus marinus. — One adult and four juveniles seen 13 Aug., and one adult and two juveniles 25 Aug.

38. **Herring Gull**

Larus argentatus smithsonianus.—Up to about 15 seen almost daily. Probably breeds on the islands off shore a few miles north.

39. **Ring-billed Gull**

Larus delawarensis. — A few seen on 18 and 25 July. Some of the gulls often seen at a distance were probably of this species.

40. **Arctic Tern**

Sterna paradisaea.—11 birds seen fishing inside the river mouth on 20 June and three on 21 June were provisionally identified as

this species by the decided greyness of the bodies in comparison with those of the familiar common tern. No more was seen of these birds until a week or so later the wings and tails of at least five were found at an Indian camp site. No tarsi could be found, but Mr. W. Earl Godfrey was able to confirm the identity from examination of the wings and tails. Two more birds were seen on 25 Aug.

41. **Short-eared Owl**

Asio flammeus flammeus. — First noted 10 Aug.; seen frequently thereafter in numbers up to ten. Never seen in full daylight unless disturbed, which perhaps accounted for their survival, for they were very tame and squeaking would bring them close about one's head. They usually appeared at or just after sunset.

42. **Flicker**

Colaptes auratus.—Two seen 12 July a few miles up the river, where the forest was denser than near the coast.

43. **Eastern Phoebe**

Sayornis phoebe.—One was clearly seen and another heard a short way off on 28 June on a rocky wooded stretch of the river bank. At the time, the writer did not realize how far this station was from the normal northern limits of the phoebe. As this stretch of the river bank was of difficult access it was infrequently visited and it is not known what became of these birds. It can only be supposed that they were carried beyond their normal destination by a strong south wind during their spring migration. (See also Cowbird).

44. **Northern Horned Lark**

Eremophila alpestris alpestris.—Several pairs nested on the open sand delta near the settlement. Young not quite flying were seen on 14 July. The resident birds and the later migrants all showed the bright yellow facial markings of this race. Migrants from up the coast began to appear about 2 Sept. From 4 Sept. onward 200 or more were present each day on this single area. The peak of migration seemed to be 6 - 8 Sept., but the species was still plentiful on 10 Sept. and one or more later peaks may have occurred. On some days the flocks milled about the delta in a way that made counts impossible; but on 6 Sept., when they were moving steadily across the river, 2,500 were estimated to pass in a few hours. These migrants employed two calls that were unfamiliar to the writer: a 'tee-ew' in quality much like the 'too-ee' of the semipalmated plover; and a dry, fast 'dit-dit-dit-dit' slightly like the buzzy call of the redpoll. It appears that many of the birds from the northern barrens funnel through this coastal strip of unwooded country.

45. **Canada Jay**

Perisoreus canadensis. — Plentiful wherever spruce was abundant. When we first arrived, the young were on the wing and with apparently fully grown rectrices, but were still in family groups with the adults and were a uniform deep slate gray. By the end of June, the family groups were tending to break up and individual juveniles were seen more often. During August, the plumage of the young birds became noticeably lighter and the head markings began to show.

46. **Raven**

Corvus corax principalis.—Several seen in June and late August, but not between. Possibly the summer concentration of natives at the settlement tends to keep them away.

47. **Brown-capped Chickadee**

Parus hudsonicus. — Seen in small numbers from 27 July on. Probably more abundant a few miles inland in denser forest.

48. **Robin**

Turdus migratorius. — A pair nested in willow scrub on the river bank near the settlement and others were seen in various small thickets in the area.

49. **Ruby-crowned Kinglet**

Regulus calendula calendula. — Seen in small numbers in June and July.

50. **American Pipit**

Anthus spinoletta rubescens. — A few pairs were seen on the barren hill tops and presumably bred although proof is lacking. The first definite migrants appeared on 12 Aug. They were present in great numbers (probably 500 to 1500 daily) on the delta from 18 Aug. to 5 Sept. fell abruptly to 30 on 9 Sept. and were not seen on 10 Sept. They and the northern horned larks made great inroads into a caterpillar "plague". Like the latter species, the pipits evidently funnel down the barren coastal strip, which would be almost ideal for large-scale banding.

51. **Tennessee Warbler**

Vermivora peregrina. — One seen on 27 June.

52. **Yellow Warbler**

Dendroica petechia. — A few occurred regularly on a portion of the river bank clothed in willow and alder scrub. Last seen 18 Aug.

53. **Myrtle Warbler**

Dendroica coronata coronata.—Occurred in small numbers, mainly in the stand of tall white spruce south of the river.

54. **Black-poll Warbler**

Dendroica striata.—Abundant; apparently breeding in almost every spruce thicket. Juveniles almost fully grown were seen on 13 Aug.

55. **Northern Water-thrush**

Seiurus noveboracensis. — A few seen or heard in wet alder thickets near the river. One seen feeding a juvenile just out of the nest on 16 July.

56. **Wilson's Warbler**

Wilsonia pusilla pusilla. — Several pairs occurred in wet willow-alder thickets. A male carrying food on 16 July provided breeding evidence.

57. **Rusty Blackbird**

Euphagus carolinus. — An adult and three juveniles barely able to fly were found on a gravelly stretch of river shore on 6 July.

58. **Cowbird**

Molothrus ater ater.—Two birds, clearly this species, were said to have been coming to the Hudson's Bay Company manager's house with white-crowned and savannah sparrows for crumbs for some time before we arrived. On 18 June, one male was seen clearly and a second bird of uncertain sex was seen at a distance in fog. From information received it also was probably a male. The birds were not seen again. This species was seen in small numbers at Moose Factory, Ont., which is probably near its normal limit. Possibly carried north by strong winds during migration.

59. **Redpoll**

Acanthis flammea.—Almost every clump of dwarf birch on the open ground yielded a pair of redpolls. Their behaviour indicated breeding but no nests were found. They were forming into flocks by 27 July.

60. **Pine Siskin**

Spinus pinus pinus. — A flock of eight seen 18 Aug.

61. **White-winged Crossbill**

Loxia leucoptera leucoptera.—One male seen 18 July and one female or juvenile 29 July.

62. **Savannah Sparrow**

Passerculus sandwichensis. — Abundant on open ground. Mr. Vockeroth found one nest, and the writer saw a few carrying food. Probably about thirty pairs nested on roughly one square mile near the settlement.

63. **Slate-colored Junco**

Junco hyemalis hyemalis. — Occurred in small numbers, mainly on a rocky south slope with scattered spruce.

64. **Tree Sparrow**

Spizella arborea arborea. — Abundant, usually on open ground near water with a few trees or shrubs. Dr. Jenkins found a nest on 23 June with four eggs; it was on a sphagnum hummock a foot from a pool and was lined with white willow ptarmigan feathers.

65. **White-crowned Sparrow**

Zonotrichia leucophrys leucophrys. — Very abundant. Every gully big enough to support a few small spruce supported a pair, and they also occupied willow clumps along the river bank. Perhaps the dominant species of the area as a whole. Fully fledged young were seen on 30 July. By mid August the head stripes of the juveniles were becoming distinct.

66. **White-throated Sparrow**

Zonotrichia albicollis. — A few were seen through June and July mainly along wooded stretches of the river.

67. **Fox Sparrow**

Passerella iliaca iliaca. — Abundant, especially in slightly wet areas with Labrador tea and other low shrubs and a few spruce. At first counted almost entirely by song; but after 10 July, the birds suddenly became quite aggressive for a short period, suggesting that the young had hatched. Singing largely stopped about 20 July, but there was a slight recrudescence in September.

68. **Lincoln's Sparrow**

Melospiza lincolnii lincolnii. — Recorded regularly in small numbers through June and most of July, usually by song. Not found after singing ceased.

69. **Lapland Longspur**

Calcarius lapponicus lapponicus.—A single female was seen on the sand beach on 25 June.

FOOD HABITS OF THE MARTEN (Martes americana) IN THE ROCKY MOUNTAIN REGION OF CANADA[1]

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THE MARTEN in Canada is one of the species of carnivorous mammals displaying the classical pattern of cycles in abundance with a mean phase of approximately 10 years. This pattern of population behaviour was present when the commercial fur harvest of marten in the Canadian west began (Cowan, 1938), and despite the intensive trapping to which the species was subjected, the cycle persisted for many years (Hewitt, 1921) and still persists in some parts of its range. Since 1922, however, the marten catch in British Columbia has shown little tendency toward large scale periodic fluctuations in abundance (Ann. Rept. Prov. Game Comm. 1947: L 52). Across Canada, the peak years of marten harvests were in the 19th century and since that time, the number of marten taken has gradually declined and although the phase has persisted the peaks in the cycle no longer reach the amplitude they did formerly.

The approximate coincidence of the peaks in marten catch and the known peaks in the abundance of the varying hare have suggested to many a causal relationship between the cycles in rabbits and those in marten. The inference is drawn that the varying hare provides so important a part of the marten diet that when the hare becomes scarce the marten suffers from food shortage and either dies of starvation or fails to reproduce.

In an examination of the probability of this causal relationship between the members of the two species mentioned it is pertinent to examine the food habits of the marten in order to determine to what extent it is dependent upon the varying hare for food. Several studies have revealed that the predators strictly dependent upon one food source react to its scarcity by failure to breed (Lack, 1946), while those not so dependent while they may use an abundant prey species to a large degree when it is easily available, do so merely as opportunists and not of necessity and can turn to other sources of food when the need arises. Cyclic fluctuation in the latter group may very well not be the result of cyclic changes in the population of one prey species, albeit a very obvious one, but may rather be the result of other factors, as yet elusive, inherent in the predator population or species, or imposed upon it by external influences.

There is little published information upon the food of the marten in North America. Seton (1929) outlined a general diet on the basis of field observation. Grinnell, Dixon and Linsdale (1937) reported on food items in 34 stomachs supplied by California trappers. Marshall (1946) published information based upon the analysis of 64 scats collected in Montana.

This paper presents the results of the examination of 197 scats and 3 stomachs from the Rocky Mountain National Parks of Alberta and British Columbia. Jasper Park provided 133 scats and one stomach, Banff Park 19 scats and 2 stomachs, and Kootenay Park the remainder. These were gathered during the course of wildlife studies undertaken by the senior author between 1943 and 1946 in the interest of the National Parks Service of Canada.

The results obtained from the scats and stomachs have been lumped and are expressed in terms of percent by occurrence except in the case of insects and berries. With these groups the occurrence of one or more specimens in a scat or stomach was regarded as a single occurrence.

The year-round diet, on this basis, was made up of 81% small mammals, 4.3% birds, 5.2% insects, 5.2% berries and 4.2% unidentified items or debris of no apparent food value. These percentages varied seasonally. Small mammals, for instance, contributed 76% of the summer diet, birds, 5.9%, insects 7.9% and berries 5.9%; whereas in the winter diet small mammals made up 91%, birds 1% and berries 3.8%.

DISCUSSION OF FOOD ITEMS

Small mammal trapping conducted incidentally to other studies served to give a general picture of the fauna from which the

[1] Received for publication December 29, 1949.

TABLE 1. — FOOD ITEMS REPRESENTED IN 197 MARTEN SCATS AND 3 STOMACHS

Vernacular Name	Technical Name	Percent of all Food	SUMMER 112 Scats, 3 Stomachs; 202 Items			WINTER 85 Scats; 104 Items		
			Times Occurring	Percent Occurrence in 112 Scats and 3 Stomachs	Percent of 202 Items	Times Occurring	Percent Occurrence in 85 Scats	Percent of 104 Items
Red-backed mouse	*Clethrionomys gapperi*	25.0	46.0	40.0	22.8	30.0	35.0	29.0
Short-tailed meadow mouse	*Microtus p. drummondi*	10.0	17.0	14.8	8.4	14.0	16.5	13.4
Rocky Mountain Phenacomys	*Phenacomys intermedius*	8.5	13.0	11.3	6.4	13.0	15.3	12.6
Lemming vole	*Synaptomys borealis*	4.6	5.0	4.3	2.5	9.0	10.3	8.6
White-footed mouse	*Peromyscus maniculatus*	3.6	5.0	4.3	2.5	6.0	7.1	5.8
Wood rat	*Neotoma cinerea*	1.3	4.0	3.5	2.0	—	—	—
Mouse only		13.0	29.0	25.0	14.4	11.0	13.0	10.6
TOTAL MICE		(66.0)	(119.0)		(59.0)	(83.0)		(79.9)
Red squirrel	*Sciurus hudsonicus*	3.3	7.0	6.1	3.5	3.0	3.5	2.9
Mantled ground squirrel	*Citellus lateralis*	3.3	10.0	8.7	5.0	—	—	—
Columbian ground squirrel	*Citellus columbianus*	1.3	4.0	3.5	2.0	—	—	—
Chipmunk	*Eutamias minimus*	1.3	4.0	3.5	2.0	—	—	—
Flying squirrel	*Glaucomys sabrinus*	1.0	1.0	0.9	0.5	2.0	2.4	1.9
TOTAL SQUIRRELS		(10.2)	(26.0)		(12.9)	(5.0)		(4.8)
Varying hare	*Lepus americanus*	1.6	2.0	1.7	1.0	3.0	3.5	2.9
Rock rabbit	*Ochotona princeps*	1.3	2.0	1.7	1.0	2.0	2.4	1.9
Shrew	*Sorex sp.*	1.6	4.0	3.5	2.0	1.0	1.2	0.9
Elk	*Cervus canadensis*	0.3	—	—	—	1.0	1.2	0.9
Birds		4.3	12.0	10.0	5.9	1.0	1.2	0.9
Insects		5.2	16.0	14.0	7.9	—	—	—
Berries		5.2	12.0	10.0	5.9	4.0	4.7	3.8
Moss		0.3	1.0	0.9	0.5	—	—	—
Unidentified Remains		3.9	8.0	7.0	4.0	4.0	4.7	3.8

marten was selecting its diet and with this in mind it is pertinent to examine the major categories of food items more closely.

CRICETIDAE

Mice were by far the most important item, making up 59% of the summer food and 80% of the winter food for an annual contribution of 66%. This is in close agreement with the findings of Grinnell, Dixon and Linsdale, who reported mice in more than half of the 34 stomachs examined by them.

Fifty-three percent of the mouse items were identified to species while the remaining 13% could be classified only as mice.

Clethrionomys gapperi athabascae

The red backed mouse was moderately abundant throughout the forested areas of the parks during the period covered by this study. It was certainly the most uniformly distributed small mammal in marten habitat, and is the most important food source. This one species made up 25% of the food items.

The relatively stable percentage of the food contributed by this mouse through the year is noteworthy. It occured as 22.8% of the summer food and 29% of the winter food. This uniformity, despite the natural seasonal fluctuations in the numbers of a species such as this, suggests that the marten was probably hunting it selectively and at the same time was not taking a significantly large part of the current population.

Microtus pennsylvanicus drummondi

This meadow mouse was abundant in alpine meadows and locally common in openings within the spruce forest, but was not generally distributed in the forest areas. It represented 10% of the food items and appeared more frequently in winter (13.4%) than in summer (8.4%).

Phenacomys intermedius levis

Phenacomys was not abundant during the study period but was quite generally distributed. It occurred as 8.5% of the total items and occurred almost twice as often in winter scats (12.6%) as in summer scats (6.4%).

Synaptomys borealis chapmani

The lemming vole was found to represent 4.6% of the items identified. It was generally rare over the study area but was abundant in certain subalpine meadows. This species was also found more often in winter (8.6%) than in summer scats (2.5%).

Peromyscus maniculatus

Identified as eleven of the 306 items found, the white-footed mouse constituted 3.6% of the total diet. It again predominated in the winter items (5.8%) as opposed to the summer items (2.5%).

Neotoma cinerea

Appearing only as 4 items or 1.3% of the material examined, the woodrat did not form an important part of the diet. It was scarce during the time the scats were collected and was most abundant in rocky, thinly forested areas not favoured by marten.

SCIURIDAE

Squirrels were the second most important family on the marten menu. Four genera, *Tamiasciurus, Citellus, Eutamias* and *Glaucomys* represented 10.2% of the items occurring in the scats. Marshall (1946) found this family to occur most frequently in his examination of 64 scats collected in Montana during the winters of 1941 and 1942. Squirrels were more important as a summer food than as a winter food owing, probably, to the fact that the ground squirrels and chipmunks hibernate.

Tamiasciurus hudsonicus columbiensis

Red squirrels were common during the course of this study and it was surprising to find that they had not been preyed upon to a greater extent than the 3.3% of the food items identified.

Citellus lateralis tescorum

Mantled ground squirrel remnants did not appear in any scats from Jasper Park but did, however, appear 7 times in the material from Banff Park and three times from Kootenay Park. These made up 3.3% of the items eaten over the entire area.

Citellus columbianus columbianus

The Columbian ground squirrel was abundant in meadow areas throughout the parks but showed up only as 1.3% of the food items. Living, as it does, near its burrow in open meadows, this species appears to be relatively safe from the predation of the tree-loving marten.

Eutamias minimus and *E. amoenus*

Nowhere abundant in the parks, chipmunk remains were found only four times to represent 1.3% of the diet.

Glaucomys sabrinus alpinus

Flying squirrels were very scarce in the National Park area and were found only 3 times in the marten scats.

OTHER MAMMALS

Lepus americanus columbiensis

The varying hare was not abundant during the years of this study but it was widely distributed and not rare. Its availability to carnivores is attested to by its contribution to the food of the coyote in the same region. Hatter (1945) found this species to be the most important single item in the coyote diet in Jasper Park in 1943 and 1944. Its remains occurred as 25% of the total items in 335 winter scats.

In face of this it is important to note that varying hare remains appeared only 5 times (1.6%) in the material examined by us. Apparently, then, under the conditions obtaining, marten were not seeking the hares to any extent but were devoting their maximum foraging effort to the mice.

Ochotona princeps

The pika was abundant in the timberline rock slides all over the study area and present in reduced numbers at lower elevations. Several of the trappers in the Kootenay Valley outside the Park area reported noticing a movement of marten toward the timberline rock slides during the late autumn. They assumed it was for the purpose of foraging upon the pikas there. However, it occurred only 4 times (1.3%) in our material and it seems more probable that this movement to the rock slides is for the purpose of hunting the red-backed and other mice that abound in them.

Sorex sp.

Shrews occurred in 5 scats (1.6%) even though reasonably numerous in parts of the marten habitat. Their strong smell may well render them unpalatable.

Carrion

Carrion in the form of the carcasses of large game mammals was very abundant in the park, but despite this, it was apparently avoided by marten. Elk hair was found once only and was the only evidence of the use of carrion by marten.

BIRDS

Feathers of birds were found 13 times to represent 4.3% of the food items. In one of the stomachs the remains of an unhatched bird and part of the egg shell were found. There was little to suggest that birds were important in the food of marten. They were probably taken when chance made them easily available.

INSECTS

This item was represented most frequently by grasshoppers, with crickets, moths and beetles occurring less frequently. Insects were found in 16 scats, sometimes several in a scat as evidence of deliberate foraging upon them.

BERRIES

Cranberries (*Vaccinium oxycoccus*) occurred as 5.2% of the items, estimated on the basis of one or more berries in a scat regarded as one item. As many as 25 berries occurred in a single scat.

DISCUSSION

This survey of the food of marten in the Canadian Rocky Mountains, made at a time when marten were abundant but when none of the small prey species was at cyclic peak, has revealed that the marten is probably an opportunist in much of its feeding. It takes a wide variety of food items including berries, insects and birds, but especially small mammals. It avoids carrion. Among the small mammals, neither the red squirrel nor the varying hare were being taken in proportion to their availability. It seems justifiable to assume that these animals were not hunted assiduously and that by choice the marten was feeding upon mice, for the most part red-backed mice.

It seems doubtful to us that in a mountainous habitat such as the one represented in this study, with its diversified fauna as available marten food, that the varying hare, even when much more abundant than it was during the course of the study, would be of sufficient importance to the marten to serve as a population control following its removal by epidemic die-off.

The varying hare and the grouse family are the only food species in the marten habitat subject to the "10 year" cycle and if these species, by their periodic abundance and subsequent absence, are not serving as population controls upon the marten, then the cycle in the marten is probably not induced by mere quantity of available food and is rather of more deep seated origin.

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DESCRIPTION OF A NEW NORTHWESTERN *GEOTHLYPIS*[1]

W. EARL GODFREY

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THE CHARACTERS shown by six specimens of the yellow-throat *Geothlypis trichas* from southern Yukon, which were secured for the National Museum of Canada in 1943 by C. H. D. Clarke and in 1944 by A. L. Rand (1946, National Museum of Canada Bulletin 105, p. 58), aroused some time ago the writer's suspicions that these specimens represent an undescribed subspecies. Accordingly eight additional specimens were taken in the summer of 1949 in southwestern Yukon Territory, which possess the same characters shown in the previously taken series. They plainly represent an unusually well-marked, undescribed subspecies, and since no published name appears to be available, it may be called

Geothlypis trichas yukonicola, subsp. nov.

YUKON YELLOW-THROAT

Type.—Adult male, No. 34907, National Museum of Canada collection; Jarvis River at Alaska Highway, Yukon Territory; June 29, 1949; W. Earl Godfrey.

Subspecific characters.—Upper parts, including crown and nape, much grayer (less greenish or brownish) than in *Geothlypis trichas campicola* Behle and Aldrich or *G. t. arizela* Oberholser. Yellow of under parts more restricted than in either, and paler (less orange-hued) than in *campicola* and abdomen whiter.

Measurements. — Adult male (7 specimens) : wing, 53.0 - 57.5 mm. (average, 55.4); tail, 46.1 - 53.2 (50.5); exposed culmen, 10.1 - 11.5 (10.5); tarsus, 19.8 - 20.9 (20.3). Adult female (1 specimen) : wing, 52.6 mm.; tail, 50.2; exposed culmen, 10.5; tarsus, 10.8.

Range. — Known only from southern Yukon where it is a local summer resident, but undoubtedly will be found also in northern British Columbia.

Specimens examined. — Yukon Territory : Squanga Lake, 1 juv. ♂; Canol Road at Nisutlin River, 1 ad. ♂, 1 ad. ♀, 1 juv. ♀; Canol Road at Pelly River, 2 ad. ♂; Jarvis River at Alaska Highway, 2 ad. ♂; Sulphur Lake, 1 ad. ♂; Champagne, 1 ad. ♂, 1 juv. ♀; Haines Road Mile 118, 1 juv. ♂; Carcross, 1 juv. ♂, 1 juv. unsexed.

Comments.—Although the writer has not examined material from the type locality (Athabaska Delta) of *G. t. alberticola* Oberholser, an excellent series was available from Lac la Nonne, Alberta, which presumably are similar, being readily separable from *G. t. yukonicola* mihi. Oberholser states (1948 Descriptions of New Races of Geothlypis trichas, privately published) that *alberticola* is greener above than *campestris*, whereas *yukonicola* is grayer and is conspicuously less greenish.

[1] Received for publication May 10, 1950.

BOTANICAL RESEARCH IN SCANDINAVIA: 375 CONTEMPORARY WORKERS AND THEIR SPECIAL INTERESTS [1, 2]

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IN THE SCANDINAVIAN countries, there has long been a keen awareness of the unique position of plants in the world's economy, and of the importance as well as fascination of their study. Consequently it was a very special pleasure for me to be able to revisit some of those delightful lands in July and August, 1948, to work in several of their botanical institutions, and to see something of the advances that have been made in recent years: stimulated by the exchange of views with old acquaintances and meetings with many enthusiastic workers, I soon came to feel that Canadian Plant Scientists might find useful some enumeration of what is going on in those regions that are in many ways comparable with our own, and, as a result of note-taking and subsequent correspondence, etc., assembled the following list of 375 investigators who are doing botanical or closely-related research in Scandinavia *(sensu lato,* and including a few transients). After the name of each worker, there is given what should prove to be an effective postal (usually working) address and a brief statement indicating his or her main current (or at least recent) research interest or interests — so far as could be determined.

In connection with the preparation of this list I find it a pleasure to acknowledge with warm thanks the special help given by Prof. Rolf Nordhagen, Drs. Tyge Böcher, Ilmari Hustich, Nils Hylander, Askell Löve, Th. Sørensen, and Messrs. Arne Lundqvist and Per Størmer. Far from purporting to be complete, the compilation must be emphasized as being merely provisional and, probably, in places out of date or otherwise inaccurate (e.g. in the orthography of titles and addresses in various languages). To those who have been omitted through lack of available data or recent signs of activity (perhaps owing to submergence in the preparation of a *magnum opus*) all apology is due. But publication has been urged in the interests of transatlantic collaboration and particularly in view of the forthcoming International Botanical Congress which should attract many Canadian Plant Scientists to Scandinavia in general and Sweden in particular next summer, and so as compiler I offer the list to a wider public than my immediate colleagues and correspondents — for such usefulness as it may have but without taking responsibility for its content and inevitable shortcomings. As the list is intended for the use of inhabitants of the Western Hemisphere some titles, etc., have been omitted or contracted and "Å", "Ø", "Ö", "Þ" (Th), etc., have been placed in the alphabetical position in which they would normally be expected by English readers not familiar with Scandinavian languages and customs.

Åberg, Dr. Börje; Kg. Lantbrukshögskolan, Uppsala, Sweden — Ascorbic acid metabolism; physiology of weed-destruction.

Åberg, Dr. Ewert; Kgl. Lantbrukshögskolan, Uppsala, Sweden — Taxonomy of cultivated plants; influence of growth-substances on weeds and cultivated plants.

Afzelius, Dr. Karl; Karlavägen 9, Stockholm, Sweden — Cytology of *Senecio.*

Ahlner, Dr. Sten; Universitetets Växtbiologiska Institution, Uppsala, Sweden — Taxonomy of boreal Lichenes; monograph of Scandinavian Caliciaceae.

Akdik, Sara; (foreign visitor at) Genetiska Institutionen, Lund, Sweden — Genetics of Rye.

Åkerberg, Dr. Erik; Sveriges Utsädesförenings Filial, Ultuna, Uppsala, Sweden — Genetics of induced polyploids in *Trifolium* and *Medicago;* hybridization in *Medicago* and *Poa;* apomixis in *Poa pratensis;* breeding of Clovers and the role of bees, etc., in their pollination.

Åkerman, Prof. Dr. Åke; Sveriges Utsädesförening, Svalöv, Sweden — Genetics and plant breeding of *Avena sativa* and *Triticum* spp.

Albertson, Dr. Nils; Universitetets Växtbiologiska Institution, Uppsala, Sweden —

[1] Received for publication July 4, 1949.

[2] So far could be determined at the time of compilation. The list includes a few visitors, removals, and recent deaths.

Vegetation of certain calcareous districts in Sweden.

Algéus, Dr. Sven; Universitetets Botaniska Laboratorium, Lund, Sweden — Physiology of planktonic Algae (especially the nitrogen assimilation of unicellular green Algae).

Alm, C. G.; Universitetets Botaniska Museum, Uppsala, Sweden — Arctic and boreal flowering plants; *Carex*.

Almborn, Dr. Ove; Universitetets Botaniska Museum, Lund, Sweden—Lichen vegetation and flora, especially of southern Sweden; *Pertusaria*.

Almquist, Dr. Erik; Lohegatan 13, Eskilstuna, Sweden — Flora of the Provinces of Dalarna (Dalecarlia) and Uppland.

Ålvik, Prof. Dr. Gunnar; Universitetets Botaniske Laboratorium, Blindern, Oslo, Norway — Plant physiology: various studies including electric potentials in plants.

Andersen, Mag. Alfred; Danmarks Geologiske Undersøgelse, Charlottenlund-København, Denmark — Pollen statistics.

Andersen, Mag. Knud; Skandinavisk Bryggeri-Laboratorium, Forhaabningsholmsalle, København, Denmark — Microbiology; limnology.

Andersson, Mag. Artur; Universitetets Botaniska Laboratorium, Lund, Sweden — Root cultures.

Andersson, Enar; Institutet för Skogsträdsförädling, Brunsberg(Sweden — Genetics of Coniferae, *Parnassia*, etc.; cytotaxonomy; effect of altitude on meiosis in Spruce.

Andersson, Lic. Olof; Universitetets Botaniska Museum, Lund, Sweden — Vegetation of sandy districts of southern Sweden; taxonomy and ecology of higher Fungi, in particular the Hymenomycetes of southern Sweden.

Andersson-Kottö — *see* Kottö, Irma Andersson.

Arnborg, Dr. Tore; Universitetets Växtbiologiska Institution, Uppsala, Sweden — Swedish forest trees and forest vegetation.

Asplund, Dr. Erik; Naturhistoriska Riksmuseet, Stockholm 50, Sweden — South American vascular plants.

Benum, Kons. Peter; Museet, Tromsø, Norway — Vascular flora of northern Norway.

Bergman, Dr. Bengt; Försvarets Läroverk, Uppsala, Sweden — Embriology of *Erigeron, Chondrilla,* and other Compositae.

Bernström, Lic. Peter; Genetiska Insitutionen, Lund, Sweden — Genetics and taxonomy of *Lamium* species and hybrids.

Björkman, Prof. Dr. Erik; Skogshögskolan, Experimentalfältet, Stockholm, Sweden—Mycorrhiza and fungous parasites of forest trees; timber conservation and decay due to Fungi; ecological problems of forests and heaths.

Björkman, Mag. Sven O.; Universitetets Botaniska Museum, Uppsala, Sweden — Cytogenetic-taxonomic monograph of *Agrostis* in Sweden.

Björling Prof. Dr. Karl; Kgl. Lantbrukshögskolan, Uppsala, Sweden — Fungal diseases of cultivated plants.

Bliding, Dr. Carl; Kvarngatan 49, Borås, Sweden — Taxonomy of *Enteromorpha*.

Blom, Kons. Carl; Göteborgs Botaniska Trädgård, Göteborg, Sweden—Adventive plants; Chenopodiaceae.

Böcher, Dr. Tyge W.; Universitetets Planteanatomiske Laboratorium, Gothersgade 140, København K, Denmark — Plant anatomy and cytogenetics; plant geography and sociology with special reference to Greenland; Blue-green Algae.

Börgesen, Dr. Fr.; Universitetets Botaniske Museum, Gothersgade 130, København K, Denmark — Algae, especially of salt water.

Borgström, Dr. Georg; Svenska Institutet för Konserveringsforskning, Gibraltargatan 5c, Göteborg, Sweden — Storage and canning of fruits and vegetables.

Børset, Ola; Norges Landbrukshøgskole, Vollebekk, Norway — Forestry; amelioration of *Populus tremula*.

Bosemark, N. Olof; Genetiska Institutionen, Lund, Sweden — Cytology of *Festuca pratensis* and *Centaurea*.

Boyne Petersen — *see* Petersen, J. Boye

Boysen-Jensen, Prof. Emer. Dr. Peter; Universitetets Plantefysiologiske Laboratorium, Gothersgade 140, København K,

Denmark — Plant physiology: various studies including auxins, production of dry matter, etc.

Braarud, Prof. Dr. Trygve; Universitetets Botaniske Laboratorium, Blindern, Oslo, Norway — Marine phytoplankton.

Bremer, Prof. Dr.; Norges Landbrukshøgskole, Vollebekk, Norway — Amelioration of vegetables.

Buch, Dr. Hans; Botanical Institute of the University, Unioninkatu 44, Helsinki, Finland — Taxonomy and physiology of Bryophyta, especially Hepaticae; flora of parts of Spain.

Buchwald, Prof. N. Fabritius; Klg. Veterinaer- og Landbohøjskole, Rolighedsvej 23, København V, Denmark — Plant pathology; Fungi.

Buen, Cand. Helge; Eidsvolls Landsgymnas, Eidsvoll, Norway — *Sphagnum;* ecology of mosses.

Burström, Prof. Dr. Hans; Universitetets Botaniska Laboratorium, Lund, Sweden — Water balance of trees; nitrogen assimilation; hormones and growth mechanism in higher plants.

Cedercreutz, Dr. Carl; Botanical Institute of the University, Unioninkatu 44, Helsinki, Finland — Taxonomy and ecology of Algae; aquatic vegetation.

Christensen, Mag. Tyge; Universitetets Planteanatomiske Laboratorium, Gothersgade 140, København K., Denmark — Green Algae; Musci; Nature preservation.

Christiansen, Kapt. M. P.; Bjelkes Alle 39, København K, Denmark — *Taraxacum;* resupinate Hymenomycetes.

Christiansen, Mag. M. Skytte; Universitetets Botaniske Museum, Gothersgade 130, København K, Denmark — Lichenes.

Christophersen, Dr. Erling; Universitetets Botaniske Museum, Tøyen, Oslo, Norway — Ecology; Pacific flora.

Clausen, Mag. Eva; Nørrebrogade 1I København N, Denmark — Hepaticae.

Cleve-Euler, Fru Dr. Astrid (A. Cleve von Euler); Floragatan 4, Uppsala, Sweden— Diatomeae, especially preparing a flora of Swedish and Finnish species.

Collander, Prof. Dr. Runar; Botanical Institute of the University, Unioninkatu 44, Helsinki, Finland — Plant physiology, especially the semipermeability of cells.

Dahl, Cand. Eilif; Universitetets Botaniske Museum, Tøyen, Oslo, Norway — Lichenes, especially of the Arctic; northern vascular plants; ecology.

Dahlbeck, Dr. Nils; Mäster-Samuelsgatan 3, Stockholm, Sweden — Nature conservation, etc.

Dahlgren, Prof. Dr. K. V. O.; Geijersgatan 18, Uppsala, Sweden — Plant embryology; history of botany.

Danielsen, Can. Anders; Botanisk Museum, Universitetet i Bergen, Bergen, Norway — Pollen analysis.

Danielsson, Kand. Berta; Balsgård, Fjälkestad, Sweden — Genetics and breeding of *Prunus* and *Corylus.*

Davidsson, Mag. Ingolfur; Institute of Plant Pathology, Atvinnudeild Haskolans, Reykjavik, Iceland—Floristics of some regions of Iceland, especially the east coast and the Eyjafjördur district; compiling list of plants cultivated in Reykjavik (with Ingimar Oskasson q.v.).

de Faria — *see* Faria, A. Lima de

Degelius, Dr. Gunnar; Universitetets Växtbiologiska Institution, Uppsala, Sweden —Taxonomy and distribution of boreal Lichenes; monograph of Scandinavian Collemataceae.

Du Rietz — *see* Rietz, G. Einar Du

Egede Larsen — *see* Larsen, Kari Egede.

Ehle — *see* Nilsson-Ehle, H.

Ehrenberg, Kand. Carin; Statens Skogsforskningsinstitut, Experimentalfältet, Stockholm, Sweden — Polyploidy and hybridization in *Ulmus.*

Ehrenberg, Lic. Lars; Brahegatan 41, *or* Stockholms Högskola, Stockholm, Sweden — Genetics; biochemistry; antibiotics.

Eide, Prof. Erling; Skogforsöksvesenet, Vollebekk, Norway — Forestry.

Eidem, Cand. Per; Flekkefjord Skole, Flekkefjord, Norway — Dendrochronology.

Ekdahl, Lic. Ivar; Kgl. Lantbrukshögskolan, Uppsala, Sweden — Physiology of root hairs.

Ekstrand, Lic. Harry; Statens Växtskyddsanstalt, Stockholm 19, Sweden — *Typhula* on economic plants.

Ellerström, Sven; Genetiska Institutionen, Lund, Sweden — Genetics of *Secale, Hordeum* and *Galeopsis.*

Elvers, Dr. Ivar; Gullmarsvägen 4, Enskede, Sweden — Botanical microtechnique.

Engdahl, Mag. Sven; Universitetets Botaniska Laboratorium, Lund, Sweden — Nitrogen assimilation in green Algae.

Erdtman, Dr. Gunnar; Abrahamsbergsvägen 15III, Stockholm-Abrahamsberg, Sweden — Palynology.

Ericson, Jan; Universitetets Botaniska Museum, Lund, Sweden — Floristics of southern Scandinavia.

Eriksson, Lic. John; Universitetets Botaniska Museum, Uppsala, Sweden — Taxonomy of resupinate Hymenomycetes (especially the Swedish species).

Erkamo, Mag. V.; Botanical Institute of the University, Unioninkatu 44, Helsinki, Finland — Flora of Finland, especially changes in floristics during recent years.

Erlandsson, Dr. Stellan; Sibyllegatan 7, Stockholm, Sweden — Chromosome races of Scandinavian flowering plants.

Euler — *see* Cleve-Euler, Astrid.

Faegri, Prof. Dr. Knut; Botanisk Museum, Universitetet i Bergen, Bergen, Norway — History of Norwegian flora; pollen analysis; ecology.

Fagerlind, Prof. Dr. Folke; Botaniska Institutet, Stockholms Högskola, Stockholm 6, Sweden — Cytotaxonomy and ecology of *Rosa* and *Galium*.

Fagerström, Mag. Lars; Botanical Institute of the University, Unioninkatu 44, Helsinki, Finland — Taxonomy and phytogeography of boreal plants; Lichenes.

Fåhraeus, Dr. Gösta; Kgl. Lantbrukshögskolan, Uppsala, Sweden — Cellulose decomposition by Bacteria; Fungi causing rotting.

Faria, A. Lima de; (foreign visitor at) Genetiska Institutionen, Lund, Sweden—Cytotaxonomy of *Antirrhinum*.

Fjerdingstad, E.; Vangeleddet 51, Lyngby, Denmark — Limnology; algae.

Florin, Prof. Dr. Rudolf; Bergianska Trädgården, Stockholm 50, Sweden — Taxonomy of recent and fossil Gymnospermae.

Flovik, Dr. Karl; Statens Forsøksstasjon i Plantekultur, Holt, Tromsø, Norway — Cytology of northern grasses, etc.; breeding of agricultural plants.

Foged, Niels; Naturhistorisk Forening, Aareshrupsvej 20, Odense, Denmark — Diatoms; Limnology.

Frandsen, Dr. K. J.; Øtoftegaard, Taastrup, Denmark — Genetics of cultivated plants.

Fransson, Mag. Pär; Statens Skogsforskningsinstitut, Experimentalfältet, Stockholm, Sweden — Growth substances.

Fridriksson, Mag. Sturla; Institute of Botany and Genetics, Atvinnudeild Haskolans, Reykjavik, Iceland — Genetics and floristics of Icelandic plants.

Fries, Dr. E. Th.; Visby, Sweden — Flora of the Province of Gotland.

Fries, Dr. Harald; Stampgatan 8, Göteborg, Sweden — Flora of the Province of Bohuslän.

Fries, Fru Lic. Lisbeth; Universitetets Växtfysiologiska Institution, Uppsala, Sweden — Induced mutations in *Coprinus*.

Fries, Lic. Magnus; Universitetets Växtbiologiska Institution, Uppsala, Sweden — History of *Picea abies* in southwestern Sweden.

Fries, Dr. Nils; Universitetets Växtfysiologiska Institution, Uppsala, Sweden — Experimental work on *Ophiostoma*, especially the influence of purine compounds; mutations in *Ophiostoma multiannulatum*, *Neurospora*, and other Fungi induced by X-rays and chemicals.

Fries, Prof. Emer. Dr. Robert E.; Floragatan 3, Stockholm, Sweden — African mountain flora; Annonaceae.

Frisendahl, Dr. Arvid; Björngårdsgatan 13IV, Stockholm, Sweden—Flora of the Province of Bohuslän.

Fröier, Dr. Kåre; Sveriges Utsädesförning, Svalöv, Sweden — Genetics of *Avena sativa*, *Poa pratensis*, *Trifolium*, etc.; plant breeding of *Medicago* and *Bromus*.

Fröman, Mag. Ingmar; Botaniska Institutet, Stockholms Högskola, Stockholm, Sweden — *Hedera* in Scandinavia.

Fröst, Sune; Genetiska Institutionen, Lund, Sweden — Cytology of *Centaurea scabiosa*, etc.

Funder, Dr. Sigurd; Universitetets Botaniske Laboratorium, Blindern, Oslo, Norway — Microbiology.

Gaarder, Cand. Karen Ringdal; Universitetets Botaniske Laboratorium, Blindern, Oslo, Norway — Marine phytoplankton.

Gabrielsen, Prof. Dr. E. K.; Kgl. Veterinaer og Landbohøjskole, Rolighedsvej 23, København V, Denmark — Plant physiology, especially photosynthesis.

Galløe, Dr. O.; Nybrovej, Lyngby, Denmark — Lichenes.

Gelin, Lic. Olov; Weibullsholm, Landskrona, Sweden — Genetics of induced mutations and polyploids in *Pisum, Hordeum, Trifolium,* etc.; *Avena* species; cytotaxonomy of *Erophila.*

Gelting, Dr. Paul; Dansk Arktisk Station, Godhavn, Greenland (c/o Grønlands Styrelse, Slotholmsgade 10, København K, Denmark) — Arctic plant geography; Lichenes.

Gillner, Mag. Vilhelm; Universitetets Växtbiologiska Institution, Uppsala, Sweden — Meadow vegetation of Swedish coasts.

Gjaerevoll, Kons. Olav; Kgl. Norske Videnskabers Selskab Museet, Trondheim, Norway — Norwegian flora; Scandinavian snow-bed vegetation; Bryophyta.

Gram, Mag. Ernst; Statens Plantepatologiske Forsøg, Lyngby, Denmark—Plant pathology.

Gram, Prof. Dr. Kai; Kgl. Veterinaer-og Landbohøjskole, Rolighedsvej 23, København V, Denmark — Plant anatomy and systematics; forest trees.

Gran, Prof. Emer. Dr. Haaken H.; Slemdal, Oslo, Norway — Algology; plankton; genetics of *Phaseolus;* horticulture.

Granhall, Dr. Ingvar; Balsgård, Fjälkestad, Sweden — Genetics and breeding of *Humulus, Malus, Prunus,* etc.

Grenager, Cand. Birger; Institutet for Tangforskning, Blindern, Oslo, Norway — Algology of Oslofjord; influence of pollution on the marine flora.

Grönblad, Dr. Rolf; Karis, Finland (c/o Botanical Institute of the University, Unioninkatu 44, Helsinki, Finland) — Taxonomy of Algae, especially Desmidiaceae.

Grøntved, Mag. Johs.; Universitetets Botaniske Museum, Gothersgade 130, København K, Denmark — Floristics, especially of Iceland and the Baltic regions.

Grøntved, Mag. Julius; Plankton Laboratoriet, Charlottenlund Slot, Charlottenlund-København, Denmark — Marine phytoplankton.

† Gudjonsson, Mag. Gudni; c/o Universitetets Botaniske Museum, Gothersgade 130, København K, Denmark — Cytology of flowering plants.

Gustafsson, Prof. Dr. Åke; Statens Skogsforskningsinstitut, Experimentalfältet, Stockholm, Sweden — Genetics of Barley and forest and other valuable plants, especially in connection with induced mutations; cytotaxonomy of *Rubus, Rosa,* etc.; effects of polyploidy on ecology and survival in nature; apomixis and amphimixis.

Gustafsson, Arne; Universitetets Botaniska Museum, Lund, Sweden — Floristics; the genus *Juncus.*

Hafsten, Cand. Ulf; Botanisk Museum, Universitetet i Bergen, Bergen, Norway — Pollen analysis; Tristan da Cunha and Norway.

Hagberg, Mag. Arne; Sveriges Utsädesförening, Svalöv, Sweden — Genetics of *Galeopsis tetrahit, Solanum tuberosum,* etc.; breeding of *Hordeum* and *Secale.*

Hagem, Prof. Dr. Oscar; Botanisk Laboratorium, Universitetet i Bergen, Bergen, Norway — Microbiology; soil microflora; heredity; ecology and physiology of forest trees.

Hagen, Cand. Absjørn; Statens Plantevern, Botanisk Museum, Tøyen, Oslo, Norway — Mycology; parasitic Micromycetes of Norway.

Hagerup, Dr. Olaf; Universitetets Botaniske Museum, Gothersgade 130, København K, Denmark — Cyto-ecology; ontogeny; phylogeny.

Haglund, Dr. Gustaf; Naturhistoriska Riksmuseet, Stockholm 50, Sweden — Taxonomy of *Taraxacum.*

Håkansson, Prof. Dr. Artur; Genetiska Institutionen, Lund, Sweden — Genetics of *Secale, Hordeum, Galeopsis, Poa alpina, Godetia;* apomixis in *Alchemilla;* embryology of *Poa alpina* and *Potentilla argentea.*

Håkansson, Mag. Torsten; Universitetets Botaniska Museum, Lund, Sweden — Cytotaxonomy of *Festuca rubra;* flora and vegetation of southern Scandinavia, especially plant sociology of the Beech forests of the Province of Skåne (Scania).

Halden, Dr. Bertil; Skogshögskolan, Experimentalfältet, Stockholm, Sweden—Forest soils and water problems; distribution of Scandinavian forest trees, especially

† News of death received since this compilation was last revised (N.P.).

their northern boundaries; northern outposts of southern Scandinavian plants; marine sediments and their vegetation.

Halle, Prof. Dr. Thore; Naturhistoriska Riksmuseet, Stockholm 50, Sweden — Palaeobotany.

Hansen, Mag. E. Bille; Universitetets Plantefysiologiske Laboratorium, Gothersgade 140, København K, Denmark — Plant physiology; genetics of Fungi.

Hansen, Dr. H. Mølholm; Universitetets Botaniske Museum, Gothersgade 130, København K, Denmark — Palaeobotany; plant sociology.

Hansen, Mag. J. Benth; Universitetets Botaniske Museum, Gothersgade 130, København K, Denmark — Algae; Cytology.

Hansen, Kand. Samuel; Universitetets Botaniska Laboratorium, Lund, Sweden — Physiological activity of herbicides.

Hansen — *see also* Roll-Hansen, Finn

Hansen — *see also* Roll-Hansen, Helga

Hård av Segerstad — *see* Segerstad, Fredrik Hård av

Harling, Lic. Gunnar; Stjärnvägen 11, Lidingö I, Sweden — Plant embryology; taxonomy of Cyclanthaceae.

Harmsen, Mag. Louis; Teknologisk Institut, København K, Denmark — Cytology; Musci; lignicolous Fungi.

Hartelius, Dr. Vagn; Carlsberg Laboratorium, Valby-København, Denmark — Fermentation; micronutrients of microorganisms.

Hasle, Cand. Grethe Ryther; Universitetets Botaniske Laboratorium, Blindern, Oslo, Norway — Plankton; marine botany.

Hasselrot, Lit. Torsten; Naturhistoriska Riksmuseet, Stockholm 50, Sweden — Taxonomy and distribution of boreal Lichenes; Umbilicariaceae.

Hässler, Lic. Arne; Universitetets Botaniska Museum, Lund, Sweden—Garden plants; systematics of the genus *Euphorbia.*

Häyren, Prof. Emer. Dr. Ernst; Mannerheimvägen 33, Helsinki, Finland (c/o Botanical Institute of the University, Unioninkatu 44, Helsinki, Finland) — Lichenes; Fungi; phytogeography.

Hedberg, Lic. Olov; Universitetets Botaniska Museum, Uppsala, Sweden—Mountain flora of tropical Africa.

Heiberg, Prof. Hans H. H.; Norges Landbrukshøgskole, Vollebekk, Norway — Forestry; ecology; Norwegian flora.

Hemberg, Dr. Torsten; Ulrikagatan 3, Stockholm, Sweden — Substances promoting or inhibiting growth in flowering plants.

Heribert-Nilsson — *see* Nilsson, N. Heribert

Herring, P. M.; Universitetets Botaniska Museum, Gothersgade 130, København K, Denmark — *Rosa.*

Hesselbo, Cand. A.; Bellmans Plads 22, København Ø, Denmark — Musci.

Hellesman, Mag. Erik; Kgl. Lantbrukshögskolan, Uppsala, Sweden — Mutual influence of plants on each other.

Hiitonen, Dr. Ilmari; Botanical Institute of the University, Unioninkatu 44, Helsinki, Finland — Taxonomy and phytogeography; flora of Finland; *Salix.*

Hjelmqvist, Dr. Hakon; Universitetets Botaniska Museum, Lund, Sweden — Garden plants; chimaeras; morphology of Amentiferae.

Høeg, Prof. Dr. O. A.; Universitetets Farmasøytiske Institutt, Blindern, Oslo, Norway — Palaeobotany; vernacular plant names.

Holm, Lic. Lennart; Universitetets Botaniska Museum, Uppsala, Sweden—Monographic work on the genera *Ophiobolus* and *Leptosphaeria.*

Holmberg, U.; Universitetets Botaniska Museum, Lund, Sweden — Floristics of southern Scandinavia.

Holmen, Mag. Kjeld; Universitetets Botaniske Museum, Gothersgade 130, København K. Denmark — Musci; arctic plant geography; cytology.

Horn, Cand. Kristian; Universitetets Botaniske Laboratorium, Blindern, Oslo, Norway — Cytology; genetics; Fungi.

Horn af Rantzien — *see* Rantzien, Henning Horn af

Hultén, Prof. Dr. Eric; Naturhistoriska Riksmuseet, Stockholm 50, Sweden—Flora of Alaska; distribution of boreal vascular plants.

Hustich, Dr. Ilmari; Botanical Institute of the University, Unioninkatu 44, Helsinki, Finland — Forest geography of Lapland and the Labrador Peninsula; reactions of tree growth and distribution to recent climatic changes.

Hygen, Cand. Georg; Universitetets Botaniske Laboratorium, Blindern, Oslo, Norway—Plant physiology; algology.

Hylander, Dr. Nils; Universitetets Botaniska Museum, Uppsala, Sweden — Preparing flora of vascular plants of the 'Nordic flora region'; taxonomy and nomemclature of garden plants, especially *Hosta* as cultivated in Sweden; adventive park flora, especially of *Hieracium;* revision of International Rules of Botanical Nomenclature.

Hylmö, Kand. Bertil; Universitetets Botaniska Laboratorium, Lund, Sweden — Ion absorption and transpiration.

Israelson, Dr. Gunnar; Östergaten 3, Hässleholm, Sweden — Rheophilous freshwater Algae of Sweden.

Iversen, Dr. Johs.; Danmarks Geologiske Undersøgelse, Charlottenlund-København, Denmark — Late glacial and postglacial vegetation; pollen statistics; ecology; aquatic plants.

Jakobsen, Knud; Universitetets Botaniske Museum, Gothersgade 130, København K, Denmark — Flora and vegetation of northwestern Greenland.

Jalas, Mag. Jaakko; Botanical Institute of the University, Unioninkatu 44, Helsinki, Finland — Phytogeography; taxonomy and cytology of *Thymus, Anthyllis, Viola,* etc.

Jensen, H. Nilaus; Øster Farimagsgade 2B, København Ø, Denmark — Systematics of ornamental plants; *Hedera.*

† Jensen, Prof. Emer. Hj.; Gersonsvej 55, Hellerup-København, Denmark — Plant physiology; Tobacco.

Jensen, Dir. Holger; Ramlösa Plantskola, Hälsingborg, Sweden — Genetics of induced polyploids in *Beta, Rubus, Fragaria, Vaccinium* and various Coniferae.

Jensen — *see also* Boysen-Jensen, Peter

Jessen, Prof. Dr. Knud; Universitetets Botaniske Have, Gothersgade 140, København K, Denmark — Historical plant geography; pollen statistics.

Johansson, Lic. Emil; Alnarp, Åkarp, Sweden — Genetics of fruit trees; hybridization in *Prunus* and *Fragaria.*

Johnsson, Dr. Helge; Institutet för Skogsträdsförädling, Källstorp, Sweden—Genetics and breeding of *Populus, Betula,* and Coniferae.

Jonassen, Dr. H.; Kratholmsvej 6, Holte, Denmark — Pollen statistics.

Jørgensen, Prof. Dr. C. A.; Kgl. Veterinaer- og Landbohøjskole, Rolighedsvej 23, København V, Denmark — Genetics (*Papaver,* etc.); floristics; plant pathology.

Jørgensen, Mag. E.; Danmarks Farmaceutiske Højskole, Universitetsparken 2, København Ø, Denmark — Diatomeae.

Jorstad, Dr. Ivar; Statens Plantevern, Universitetets Botanisk Museum, Tøyen, Oslo, Norway — Mycology; plant pathology.

Juel, Mag. Inger; Universitetets Plantefysiologiske Laboratorium, Gothersgade 140, København K, Denmark—Plant physiology, especially water-economy of higher plants; auxins.

Julén, Gullan; Sveriges Utsädesförening, Svalöv, Sweden — Genetics of *Medicago sativa, Phleum pratense,* etc.; breeding of Clovers.

Kalela, Prof. Dr. Aarno; Botanical Institute of the University, Unioninkatu 44, Helsinki, Finland — Taxonomy, especially of *Carex;* vegetation of Lapland and Patagonia; post-glacial history of the flora of Finland.

Kalliola, Dr. R.; Forest Institute of the University, Kirkkokatu 4, Helsinki, Finland — Floristics and plant sociology; nature conservation.

Kari, Dr. L.; Botanical Institute of the University, Turku (Abo), Finland — Lichenes; Fungi.

Karlsen, Cand. Astrid; Haakonsgt., Bergen, Norway—Denitrification Bacteria; Myxomycetes of Norway.

Key — *see* MacKey, J.

Kiellander, Lic. Carl L.; Institutet för Skogsträdsförädling, Källstorp, Sweden—Genetics of *Larix* and other Coniferae; hybridization and cytotaxonomy of *Poa.*

Kilander, Mag. Sven; Universitetets Botaniska Museum, Uppsala, Sweden — High limits of Scandinavian mountain plants.

Klykken, Cand. Odd; Den Landbrukskjemiske Kontrollstasjon, Oslo, Norway—Seeds of agricultural and technical plants; contamination of cereals.

† News of death received since this compilation was last revised (N.P.).

Knaben, Mag. Gunvor; Universitetets Botaniske Hage, Tøyen, Oslo, Norway — Cytology; chromosome numbers of alpine plants.

Køie, Dr. Mogens; Universitetets Planteanatomiske Laboratorium, Gothersgade 140, København K, Denmark — Experimental ecology; flora of Persia and Afghanistan.

Kotilainen, Prof. Dr. Mauno; Botanical Institute of the University, Unioninkatu 44, Helsinki, Finland — Phytogeography; bog and rock vegetation, especially of Lapland and Karelia.

Kottö, Dr. Irma Andersson; Wenner-Grens Institut för Experimentell Biologi, Norrtullsgatan 16, Stockholm, Sweden—Genetics of Fungi.

Krog, Cand. Hildur; Universitetets Botaniske Laboratorium, Blindern, Oslo, Norway — Chemistry of Lichens in relation to systematics.

Krosby, Cand. Peter A.; Statens Frökontrollanstalt, Ås, Norway — Adulteration of seeds.

Krusenstjerna, Dr. Edvard von; Västra Nygatan 24, Norrköping, Sweden — Phytogeography of Scandinavian Musci.

Kujala, Prof. Dr. Viljo; Forest Research Institute, Unioninkatu 40, Helsinki, Finland — Forest vegetation of Finland, Canada, etc.; ecology of forest plants and Fungi.

Kylin, Mag. Anders; Universitetets Botaniska Laboratorium, Lund, Sweden — Sulphur and nitrogen metabolism.

†Kylin, Prof. Emer. Dr. Harald; Universitetets Botaniska Laboratorium Lund, Sweden — Physiology and taxonomy of marine Algae.

Lagerberg, Prof. Emer. Dr. Torsten; Mörby, Stocksund, *or* c/o Skogshögskolan, Experimentalfältet, Stockholm, Sweden — Dendrology; forest mycology and taxonomy; nature conservation.

Lagerkranz, Rev. J.; c/o Naturhistoriska Riksmuseet, Stockholm 50, Sweden — Vascular plants of arctic and subarctic regions.

Lamm, Dr. Robert; Genetiska Institutionen, Lund, Sweden — Genetics of *Pisum sativum, Solanum tuberosum* and *S. acaule;* cytotaxonomy.

Lamprecht, Dr. Herbert; Weibullsholm, Landskrona, Sweden—Genetics of *Pisum sativum* and *Phaseolus vulgaris; Phaseolus* hybrids.

Lange, Bodil; Universitetets Botaniske Museum, Gothersgade 130, Köbenhavn K, Denmark — Musci (*Sphagnum*).

Lange, Mag. Joh.; Kgl. Veterinaer-og Landbohøjskole, Rolighedsvej 23, København V, Denmark — Dendrology.

Lange, Mag. M.; Universitetets Planteanatomiske Laboratorium, Gothersgade 140, København K, Denmark — Fungi.

Lange, Thorvald; Olympiavägen 13, Hälsingborg, Sweden — Flora of the Province of Skåne (Scania).

Langlet, Dr. Olof; Statens Skogsforskningsinstitut, Experimentalfältet, Stockholm, Sweden — Forest ecology; nutrition of Conifers; introduction of foreign trees.

Larsen, Cand. C. Muhle; c/o Forst- og Jagtmuseet, Hørsholm, Denmark—Vegetative propagation of forest trees; growth hormones.

Larsen, Dr. C. Syrach; Forstbotanisk Have, Charlottenlund-København, Denmark — Forest trees.

Larsen, Kai; Universitetets Botaniske Laboratorium, Gothersgade 140, København K, Denmark — Cytology.

Larsen, Cand. Kari Egede; Botanisk Museum, Universitetet i Bergen, Bergen, Norway — Pollen analysis.

Larsen, Dr. Poul; Universitetets Plantefysiologiske Laboratorium, Gothersgade 140, København K, Denmark (at present c/o Department of Botany, University of Chicago, Chicago 37, Ill., U.S.A.) — Plant physiology, especially growth hormones.

Leissner — *see* Nilsson-Leissner, Gunnar

Lemberg, Dr. Bertel; c/o Botanical Institute of the University, Unioninkatu 44, Helsinki, Finland — Floristics and phytogeography of southern Finland.

Levan, Dr. Albert; Genetiska Institutionen, Lund, Sweden — Genetics of induced polyploids, etc., in Yeasts, *Beta, Trifolium, Raphanus, Sinapis, Brassica, Linum, Phleum,* and of natural polyploids in *Allium nutans;* effects of colchicine and other substances.

† News of death received since this compilation was last revised (N.P.).

Levring, Dr. Tore; Göteborgs Botaniska Trädgård, Göteborg, Sweden — Australian Algae; physiology of marine Algae.

Lid, Kons. Johannes; Universitetets Botaniske Museum, Tøyen, Oslo, Norway—Arctic and Norwegian floristics, including preparation of a new edition of his 'Norsk Flora'; *Sphagnum.*

Lihnell, Dr. Daniel; Statens Växtskyddsanstalt, Stockholm 19, Sweden — Fungal and virus diseases of cultivated plants.

Liljebäck, Lars; Skogshögskolan, Experimentalfältet, Stockholm, Sweden — The distribution of spontaneous Beech forests.

Liljefors, Lic. Alf; Åsbacken 35, Ålsten, Sweden — Embryology of *Sorbus.*

Lillieroth, Mag. Gunvor; Universitetets Botaniska Museum, Lund, Sweden—Freshwater Algae.

Lillieroth, Lic. Sigvard; Universitetets Limnologiska Institution, Lund, Sweden — The regulation of lakes and its influence on vegetation.

Lima de Faria — *see* Faria, A. Lima de

Lindeberg, Dr. Gösta; Universitetets Växtfysiologiska Institution, Uppsala, Sweden — Rôle of polyphenol oxidases in the physiology of Fungi; biological decomposition of lignin.

Lindfors, Prof. Dr. Thore; Statens Växtskyddsanstalt, Stockholm 19, Sweden — Plant pathology; Uredineae.

Lindquist, Prof. Dr. Bertil; Skogshögskolan, Experimentalfältet, Sweden — Plant sociology; genetics and ecology of forest trees; tree breeding and silviculture.

Lindqvist, K.; Hilleshög, Landskrona, Sweden — Genetics of *Pisum sativum* and *Lactua.*

Linnermark, Mag. Nils; Universitetets Botaniska Museum, Lund, Sweden — Soils and plant sociology in southern Scandinavia.

Ljunger, Kand. Sven-Åke; Institutet för Skogsträdsförädling, Källstorp, Sweden—Genetics of *Brassica, Sinapis, Raphanus,* and generic and other crosses between various Cruciferae.

Lohammar, Dr. Gunnar; Universitetets Växtfysiologiska Institution, Uppsala, Sweden — Taxonomy and cytology of *Butomus* and *Thalictrum simplex.*

Löve, Dr. Askell; Institute of Botany and Genetics, Atvinnudeild Haskolans, Reykjavik, Iceland — Cytotaxonomy of Icelandic plants; origin of the Icelandic flora; polyploidy in northern regions; ecological investigations on some nunatak areas of the last glacial age; cytogenetics of *Rumex* s. l.

Löve, Dr. Doris; Institute of Botany and Genetics, Atvinnudeild Haskolans, Reykjavik, Iceland — Cytotaxonomy of Icelandic plants; origin of the Icelandic flora; polyploidy in northern regions; cytogenetics, etc., of Silenoideae (especially the problem of sex and isolation of *Melandrium* species).

Lövkvist, Kand. Börje; Kgl. Lantbrukshögskolan, Uppsala, Sweden — Cytology in relation to taxonomy and ecology of *Cardamine* (especially *C. pratensis*), and the genetics of its natural polyploids.

Lund, Mag. Aage; Tuborg Laboratorium, Hellerup-København, Denmark — Microbiology.

Lund, Mag. Søren; Dansk Biologisk Station, Charlottenlund Slot, Charlottenlund-København, Denmark — Marine Algae.

Lundegårdh, Prof. Dr. Henrik; Kgl. Lantbrukshögskolan, Uppsala, Sweden — Absorption and transport of ions; bleeding of plants.

Lundell, Dr. Seth; Universitetets Botaniska Museum, Uppsala, Sweden — Taxonomy of Swedish Hymenomycetes, especially Polyporaceae; editor (with J. A. Nannfeldt q.v.) of 'Fungi exsicatti suecici'.

Lunden, Dr. Askel P.; Norges Landbrukshøgskole ,Vollebekk, Norway — Amelioration of potatoes.

Lundh, Lic. Asta; Universitetets Botaniska Laboratorium, Lund, Sweden — Freshwater ecology, in particular lake vegetation of the Province of Skåne (Scania).

Lundqvist, Kand. Arne; Genetiska Institutionen, Lund, Sweden — Genetics of Rye.

Luther, Mag. Hans; Botanical Institute of the University, Unioninkatu 44, Helsinki, Finland — Taxonomy and phytogeography; ecology of water plants.

Lyche, Prof. Dr. Ralph Tambs; Universitetet i Oslo, Oslo, Norway — Floristics; weed flora of Norway.

MacKey, J.; Sveriges Utsädesförening, Svalöv, Sweden — Genetics of induced mutations in *Triticum,* etc.; breeding of Wheat and Oats.

Magnusson, Dr. A. H.; Göteborgs Botaniska Trädgård, Göteborg, Sweden—Taxonomy of Lichenes.

Malmström, Prof. Dr. Carl; Statens Skogsforskningsinstitut, Experimentalfältet, Stockholm, Sweden — Forest types; wood-ash as a fertilizer of bogs and peat.

Marklund, Dr. G.; Botanical Institute of the University, Unioninkatu 44, Helsinki, Finland—Taxonomy of *Potentilla, Taraxacum,* and especially *Ranunculus.*

Mårtensson, Kand. Olle; Universitetets Botaniska Museum, Uppsala, Sweden — Distribution and ecology of Scandinavian Bryophytes.

Mathiesen, Prof. Fr. J.; Danmarks Farmaceutiske Højskole, Universitetsparken 2, København Ø, Denmark — Plant anatomy; palaeobotany.

Mattisson, Kand. Carl H.; Universitetets Botaniska Museum, Lund, Sweden — Systematics of Orchidaceae, especially Cytotaxonomy of Swedish *Orchis* species of the section Dactylorchis.

Melderis, A.; Universitetets Botaniska Museum, Uppsala, Sweden — Monographic work on boreal species of *Agropyron* and *Elymus;* Mongolian grasses.

Melin, Prof. Dr. Elias; Universitetets Växtfysiologiska Institution, Uppsala, Sweden — Influence of amino acids on growth of Fungi (especially mycorrhiza Fungi); morphogenic influence of exudates of Fungi on roots of *Pinus sylvestris* (with V. Slankis q.v.); antibiotic substances from Hymenomycetes (with K. Oblom q.v.).

Meurman, Prof. Olavi; Maatalouskoelaitos, Puurtarhaosasto, Piikkiö, Finland—Cytogenetics of *Ribes,* etc.

Michanek, Göran; Genetiska Institutionen, Lund, Sweden — Genetics of *Brassica* and *Sinapis.*

Mikaelsen, Cand. Knut; Norges Landbrukshøgskole, Vollebekk, Norway — Genetics; *Godetia; Draba.*

Mikkelsen, Dr. Vald.; Danmarks Farmaceutiske Højskole, Universitetetsparken 2, København Ø, Denmark — Ecology; pollen statistics.

Moen, Prof. Olav; Norges Landbrukshøgskole, Vollebekk, Norway — Landscape gardening; dendrology, horticulture.

Mølholm Hansen — *see* Hansen, H. Mølholm.

Möller, F. H.; Vesterskovvej 66, Nyköbing Falster, Denmark — Fungi.

Mork, Prof. Dr. Elias; Skogforsøksvesenet, Ås, Norway — Forest botany; ecology.

Müller, Prof. Dr. D.; Universitetets Plantefysiologiske Laboratorium, Gothersgade 140, København K, Denmark — Plant physiology, especially enzymes and production of dry matter.

Munk, Anders; Silkeborg, Denmark—Fungi.

Müntzing, Prof. Dr. Arne; Genetiska Institutionen, Lund, Sweden—Genetics of Rye, *Galeopsis tetrahit, Poa, Hordeum, Triticale;* cytotaxonomy and ecology of polyploids and hybrids of *Potentilla;* apomixis in *Poa alpina* and *Potentilla.*

Nannfeldt, Prof. Dr. John A.; Universitetets Botaniska Museum, Uppsala, Sweden — Taxonomy of Ascomycetes and apomictic microspecies of the *Ranunculus auricomus* group; *Poa;* editor (with S. Lundell q.v.) of 'Fungi exsicatti suecici'.

Naustdal, Jakob; Folkehøgskulen, Store-Milde pr. Bergen, Norway — Norwegian flora.

Nielsen, Prof. Dr. E. Steeman; Danmarks Farmaceutiske Højskole, Universitetsparken 2, København Ø, Denmark — Plant physiology; biochemistry.

Nielsen, Dr. Niels; Laboratorium för Livsmedalskemi, Kgl. Tekniska Högskolan, Stockholm, Sweden — Plant physiological chemistry, in particular growth substances; vitamin-production by microorganisms.

Nilsson, E.; Ohlsens Enke, Malmö, Sweden—Genetics of *Pisum, Solanum, Lycopersicum, Cucumis;* breeding of *Lycopersicum;* hybridization in *Raphanus.*

Nilsson, Prof. Dr. Fredrik; Alnarp, Åkarp, Sweden — Genetics of induced polyploids in *Sinapis, Brassica, Raphanus, Pyrus, Fragaria, Ribes, Lactuca, Spinacia, Cucurbita;* hybridization in *Ribes.*

Nilsson, Prof. Emer. Dr. N. Heribert; Universitetets Botaniska Museum, Lund, Sweden — Experimental genetics and taxonomy of *Salix* hybrids, etc., and palaeontology of the genus; preparing book on species problems and theory of evolution.

† Nilsson-Ehle, Prof. Emer. Dr. H.; Tornaplatsen 5, Lund, Sweden — Genetics of induced polyploids in *Populus* and *Pyrus*.

Nilsson-Leissner, Prof. Dr. Gunnar; Statens Centrala Frökontrollanstalt, Stockholm 19, Sweden — Seed control.

Nissen, Cand. Øivind; Norges Landbrukshøgskole, Vollebekk, Norway — Amelioration of grasses; analysis of grassland.

Nordal, Prof. Dr. Arnold; Farmasøytisk Institutt, Blindern, Oslo, Norway — Pharmacognosy; morphology and anatomy of *Sedum* species; investigation of popular Norwegian herbs; plant-folklore of Norway.

Nordenskiöld, Dr. Hedda; Kgl. Lantbrukshögskolan, Uppsala, Sweden — Cytology and taxonomy of *Phleum, Brassica, Sinapis, Raphanus, Luzula*.

Nordhagen, Prof. Dr. Rolf; Universitetets Botaniske Hage og Museum, Tøyen, Oslo, Norway — Phytogeography; Norwegian flora and vernacular plant names; quaternary history of the European flora; dispersal of plants.

Nordli, Cand. Erling; Universitetets Botaniske Laboratorium, Blindern, Oslo, Norway — Plankton; marine botany.

Norkrans, Fru Lic. Birgitta; Universitetets Växtfysiologiska Institution, Uppsala, Sweden — Physiology of *Tricholoma*, especially comparative studies of purely saprophytic and mycorrhiza-forming species.

Norlindh, Dr. Tycho; Universitetets Botaniska Museum, Lund, Sweden — Taxonomy of *Calendula;* phytogeography of South African and Mongolian vascular plants.

Nybom, Nils; Genetiska Institutionen, Lund, Sweden—Genetics of induced mutations, especially in *Hordeum;* cytogenetics of *Allium*.

Nygaard, Mrg. G., Ordrup Gymnasium, Charlottenlund, Denmark—Limnology; freshwater plankton.

Nygren, Dr. Axel; Kgl. Lantbrukshögskolan, Uppsala, Sweden — Cytotaxonomy and ecology of *Calamagrostis, Melandrium*, and other critical (especially apomictic) boreal siphonogamous genera.

Nyholm, Fru Elsa; Universitetets Botaniska Museum, Lund, Sweden — Bryophyta, especially Hepaticae; systematics of the genus *Carex*.

Öblom, Mag. Karin; Universitetets Växtfysiologiska Institution, Uppsala, Sweden—Antibiotic substances from Hymenomycetes (with E. Melin q.v.).

Ødegård, Cand. Knut; Universitetets Botaniske Laboratorium, Blindern, Oslo, Norway — Plant physiology.

Olsen, Dr. Carsten; Carlsberg Laboratorium, Valby-København, Denmark — Plant physiology, especially mineral nutrition.

Olsen, Sigurd; Parnasvej 5, København, Denmark — Limnology; Charales.

Olsson, Mag. Gösta; Sveriges Utsädesförening, Svalöv, Sweden — Genetics of induced polyploids, etc., in *Brassica, Sinapis, Raphanus* and crosses between various Cruciferae.

Omang, Cand. S. O. F.; Lersolvegene 18, Sogn Hageby, Oslo, Norway (c/o Universitetets Botaniske Museum, Tøyen, Oslo, Norway) — *Hieracium*.

Omvik, Cand. Aasa; Botanisk Laboratorium, Universitetet i Bergen, Bergen, Norway — Microbiology.

Oskarsson, Ingimar; Institute of Fishing Research, Atvinnudeild Haskolans, Reykjavik, Iceland — Floristics of the neighbourhood of Reykjavik; compiling list of plants cultivated in Reykjavik (with Ingolfur Davidsson q.v.).

Östergren, Lic. Gunnar; Genestika Institutionen, Lund, Sweden — Polyploid induction by N_2O; genetics of *Anthoxanthum;* effect of chemicals on *Allium cepa*.

Österlind, Dr. Sven; Universitetets Växtfysiologiska Institution, Uppsala, Sweden—Experimental researches on carbon sources of planktonic Chlorophyta.

Osvald, Prof. Dr. Hugo; Kgl. Lantbrukshögskolan, Uppsala, Sweden—Plant breeding; weed-destroying substances.

Palmgren, Prof. Dr. Alvar; Botanical Institute of the University, Unioninkatu 44, Helsinki, Finland — Taxonomy, especially of *Carex* and *Hieracium*.

Palmgren, Lic. Oscar; Glemenstorget 6, Lund, *or* c/o Universitetets Botaniska Laboratorium, Lund, Sweden — Cytology of *Potamogeton*.

Pehrson, Lic. Stig; Svenska Träforskningsinstitutet, Drottning Kristinas väg 61, Stock-

† News of death received since this compilation was last revised (N.P.).

holm, Sweden — Antibiotic effects of Bacteria on Blue-stain Fungi.

Persson, Åke; Universitetets Botaniska Museum, Lund, Sweden — Plant sociology of mountain marshes.

Persson, Arne; Universitetets Botaniska Laboratorium, Lund, Sweden — Nutrition and germination of Pine seedlings.

Persson, Dr. Herman; Naturhistoriska Riksmuseet, Stockholm 50, Sweden — Bryophyta of Scandinavia, Alaska, etc.; South American Hepaticae.

Perttula, Dr. Uuno; c/o Botanical Institute of the University, Nnioninkatu 44, Helsinki, Finland — Phytogeography.

Pesola, Prof. Dr. Vilho; Maatalouskoelaitos, Jokioinen, Finland — Plant breeding; phytogeography.

Peters, Mag. Bengt; Universitetets Botaniska Laboratorium, Lund, Sweden—Physiology of marine Algae.

Petersen, Prof. E. J.; Kgl. Veterinaer- og Landbohøjskole, Rolighedsvej 23, København V, Denmark — Microbiology.

Petersen, Dr. J. Boye; Universitetets Botaniske Museum, Gothersgade 130, København K, Denmark — Aerial Algae; microbiology.

Pettersson, Lic. Bengt; Visby, Sweden—Flora and vegetation of the Province of Gotland, especially as influenced by cultivation; Orchidaceae of Gotland.

Pettersson, Dr. Bror; Botanical Institute of the University, Unioninkatu 44, Helsinki, Finland — Dispersal of seeds and spores; influence of human culture on plant life; Flora of Canary Islands.

Pohjakallio, Prof. Dr. Onni; Plant Pathological Institute of the University, Malmi, Finland — Plant diseases; photoperiodicity.

Porsild, Mag. Morten P.; Brøndbyvester pr Glostrup, *or* c/o Universitetets Botaniske Museum, Gothersgade 130, København K, Denmark — Arctic vascular plants, especially flora of Greenland.

Printz, Prof. Dr. Henrik; Institutt for Tangforskning, Blindern, Oslo, Norway — Algae; phenology.

Quennerstedt, Lic. Nils; Universitetets Växtbiologiska Institution, Uppsala, Sweden — Taxonomy, distribution, and ecology of Swedish freshwater Diatomeae.

Rantzien, Lic. Henning Horn af; Naturhistoriska Riksmuseet, Stockholm 50, Sweden — Monographic work on *Potamogeton* in South America; Characeae.

Rasmussen, R.; Thorshavn, The Faeroes — Preparing new edition of his *'Föroya Flóra'*.

Rasmusson, Prof. Dr. Johan; Hilleshög, Landskrona, Sweden — Genetics and breeding of Sugar-beets.

Reiersen, Cand. Johannes; Byåsvegen 54b, Trondheim, Norway — Norwegian flora.

Reisaeter, Cand. Oddvin; Norges Landbrukshøgskole, Vollebekk, Norway — Dendrology; horticulture.

Rennerfelt, Dr. Erik; Statens Skogsforskningsinstitut, Experimentalfältet, Stockholm, Sweden — Wood preservation; forest pathology; Root-rot (*Polyporus annosus*); *Peridermium*.

Rietz, Prof. Dr. G. Einar Du; Universitetets Växtbiologiska Institution, Uppsala, Sweden — Plant communities of Scandinavian bogs; vegetation of high mountains; *Euphrasia* (especially tropical species).

Robak, Dr. Håkon; Vestlandets Forstlige Forsøksstasjon, Bergen, Norway—Fungi on wood pulp; forest trees.

Rodhe, Dr. Wilhelm; Universitetets Limnologiska Institution, Uppsala, Sweden — Chemistry of Swedish fresh waters and ecology of phytoplankton.

Røed, Cand. Håkon; Statens Plantevern, Universitetets Botaniske Museum, Tøyen, Oslo, Norway — Mycology; plant pathology.

Roivainen, Mag. Heikki; Botanical Institute of the University, Unioninkatu 44, Helsinki, Finland — Bryophyta of Finland and Patagonia.

Roll-Hansen, Mag. Finn; Norges Landbrukshøgskole, Vollebekk, Norway — Forest botany; mycology.

Roll-Hansen, Cand. Helga; Norges Landbrukshøgskole, Vollebekk, Norway — Bacteriology; plant pathology.

Romell, Prof. Dr. Lars-Gunnar; Statens Skogsforskningsinstitut, Experimentalfältet, Stockholm, Sweden — Forest soils and nutrition problems (especially the rôle of minor elements); decomposition of litter by Fungi.

Rosen, Dr. Gösta von; Hilleshög, Landskrona, Sweden — Genetics of induced mutations and polyploids in *Pisum* and *Beta;* rela-

tionship of species in *Pisum*, and cytology of species-crosses.

Ruden, Cand. Tollef; Skogforsöksvesenet, Vollebekk, Norway — Amelioration of Norwegian forest-trees.

Rufelt, Kand. Brita; Sveriges Utsädesförening, Svalöv, Sweden — Genetics of induced polyploids, etc., in *Brassica, Sinapis, Raphanus.*

Rufelt, Mag. Henry; Universitetets Botaniska Laboratorium, Lund, Sweden — Nitrogen metobolism in nitrophilous plants.

Rune, Lic. Olof; Universitetets Växtbiologiska Institution, Uppsala, Sweden — Phanerogamic flora of the mountains of southern Lapland, especially on serpentine rocks.

Runemark, Hans; Universitetets Botaniska Museum, Lund, Sweden — Lichen taxonomy and phytogeography; marine Algae; thermophilic plants of Scandinavian mountains.

Sandberg, Lic. Gustaf; Kyrkogårdsgatan 11, Uppsala, Sweden — Solifluction in Swedish Lapland; grass vegetation of airfields.

Santesson, Lic. Rolf; Universitetets Botaniska Museum, Uppsala, Sweden — Preparing world monograph of epiphyllous Lichenes; taxonomy of Swedish and South American Lichenes; 'lichen parasites'.

Segerstad, Dr. Fredrik Hård av; Göteborgs Botaniska Trädgård, Göteborg, Sweden— Flora of the Province of Värmland.

Selander, Lic. Sten; Universitetets Växtbiologiska Institution, Uppsala, Sweden — Vascular plant flora of Lule Lappmark, Sweden.

Selling, Dr. Olof H.; Naturhistoriska Riksmuseet, Stockholm 50, Sweden — Tertiary flora of the southern hemisphere.

Siggeirsson, Mag. Einar; Museum of Natural History, Reykjavik, Iceland — Floristics of Icelandic plants; agronomy.

Sjörs, Dr. Hugo; Universitetets Växtbiologiska Institution, Uppsala, Sweden — Bog vegetation of northern Sweden; taxonomy and ecology of *Sphagnum.*

Skard, Prof. Olav; Norges Landbrukshøgskole, Vollebekk, Norway — Pomology.

Skottsberg, Prof. Emer. Dr. Carl; Göteborgs Botaniska Trädgård, Göteborg, *or* Naturhistoriska Riksmuseet, Stockholm 50, Sweden — Pacific flora, especially of Hawaii, New Zealand, and South America; Swedish Myxomycetes.

Skovsted, Dr. A.; Carlsberg Laboratorium, Valby-Köbenhavn, Denmark — Genetics; mycology.

Skuja, Prof. Dr. Heinrichs; Universitetets Botaniska Museum, Uppsala, Sweden — Taxonomy of Swedish freshwater phytoplankton; freshwater Rhodophyceae; sulphur organisms.

Slankis, Dr. V.; Universitetets Växtfysiologiska Institution, Uppsala, Sweden — Morphogenic influence of exudates of Fungi on roots of *Pinus sylvestris* (with E. Melin q.v.).

Sløgedal, Cand. Haakon; Det Kgl. Selskap for Norges Vel, Oslo, Norway — Mountain grasslands; pastures.

Smith, Cand. Folmer D.; Norges Landbrukshøgskole, Vollebekk, Norway — Photoclimate of Norway and Svalbard in relation to plant-growth.

Smith, Dr. Harry; Universitetets Botaniska Museum, Uppsala, Sweden — Taxonomy of critical Scandinavian mountain phanerogams; Chinese Gentianaceae.

Sørensen, Prof. Dr. Nils Andreas; Norges Tekniske Högskole, Trondheim, Norway — Chemistry of plants; alpine flora of Norway.

Sørensen, Dr. Thorvald; Kgl. Veterinaer- og Landbohøjskole, Rolighedsvej 23, København V, Denmark — Plant sociology; systematics; arctic plants (especially Greenland phanerogams).

Söyrinki, Dr. Niilo; Forest Institute of the University, Kirkkokatu 4, Helsinki, Finland — Floristics and ecology of alpine plants in Lapland and central Europe.

Stålfelt, Prof. Dr. M. G.; Botaniska Institutet, Stockholms Högskola, Stockholm, Sweden — Water balance; plasma viscosity of plants; photosynthesis.

Steeman Nielsen — *see* Nielsen, E. Steeman.

Steindorsson, Steindor; Menntaskolinn, Akureyri, Iceland — Floristics and phytogeography of the central highland of Iceland.

Stenar, Dr. Helge; Erik Dahlbergsgatan 14, Södertälje, Sweden — Plant embryology.

Stenlid, Lic. Göran; Kgl. Lantbrukshögskolan, Uppsala, Sweden — Physiology of respiration.

Sterner, Dr. Rikard; Göteborgs Botaniska Trädgård, Göteborg, Sweden — Flora of the Province of Öland; continental elements in the flora of southern Sweden.

Stordal, Cand. Jens; Voss, Norway — Mycology; Hymenomycetes of Norway.

Störmer, Kons. Per; Universitetets Botaniske Museum, Töyen, Oslo, Norway — Norwegian flora; Bryophyta; ecology.

Stoy, Volkmar; Universitetets Botaniska Laboratorium, Lund, Sweden — Light and nitrogen metabolism.

Strøm, Prof. Dr. Kaare; Universitetets Limnologiske Institutt, Blindern, Oslo, Norway — Limnology; freshwater Algae.

Sundene, Cand. Ove; Universitetets Botaniske Museum, Töyen, Oslo, Norway — Algology of the Oslofjord region.

Suneson, Dr. Svante; Slättgårdsgatan 6, Göteborg, Sweden — Calcareous Algae.

Suomalainen — *see* Therman-Suomalainen, Eeva

Svedelius, Prof. Emer. Dr. Nils E.; Universitetets Växtfysiologiska Institution, Uppsala, Sweden — Monograph of the genus *Galaxaura.*

Svensson, V.; Weibullsholm, Landskrona, Sweden — Genetics of Tomatoes, Cucumbers, and Melons.

Sylvén, Prof. Dr. Nils; Institutet för Skogsträdsförädling, Källstorp, Sweden — Genetics of induced polyploids in *Populus;* plant breeding of Coniferae.

Täckholm, Fru Vivi; Svarvaregatan 13, Stockholm, Sweden — Flora of Egypt.

Tambs Lyche — *see* Lyche, Ralph Tambs

Tamm, Mag. Carl Olof; Statens Skogsforskningsinstitut, Experimentalfältet, Stockholm, Sweden — Regeneration, etc., in plant communities; nutrient content of forest plants.

Tedin, Dr. Olof; Sveriges Utsädesförening, Svalöv, Sweden — Genetics of *Solanum tuberosum.*

Teiling, Dr. Einar; Klostergatan 10, Linköping, Sweden — Swedish freshwater plankton.

Tengner, Mag. Jan; Skogshögskolan, Experimentalfältet, Stockholm, Sweden — Bacteria of forest soils; chlorate poisoning of forest vegetation.

Therman-Suomalainen, Dr. Eeva; Botanical Institute of the University, Unioninkatu 44, Helsinki, *or* State Horticultural Institute, Piikkiö, Finland — Cytogenetics and biochemistry of *Polygonatum,* etc.

Thorlaksson, Cand. Gundmundur, Eikjuvogur 13, Reykjavik, Iceland — Icelandic and arctic floristics.

Thorsrud, Prof. Arne; Norges Landbrukshøgskole, Vollebekk, Norway — Horticultural investigations.

Thunmark, Prof. Dr. Sven; Universitetets Limnologiska Institution, Lund, Sweden —Limnology, in particular of Swedish lakes.

Traaen, Prof. A. E.; Norges Landbrukshøgskole, Vollebekk, Norway — Microbiological investigations.

Tuomikoski, Dr. Risto; Botanical Institute of the University, Unioninkatu 44, Helsinki, Finland — Taxonomy and ecology of Bryophyta, especially of eastern subarctic Canada; Fungi.

Turesson, Prof. Dr. Göte; Kgl. Lantbrukshögskolan, Uppsala, Sweden — Ecotypes of boreal vascular plants; colchicine-induced polyploidy, especially in economic plants such as *Trifolium, Brassica, Sinapis, Raphanus,* and crosses between various Cruciferae; microspecies of *Alchemilla vulgaris* s. l.

Ulvinen, Dr. A.; c/o Botanical Institute of the Universty, Unioninkatu 44, Helsinki, Finland — Phytogeography.

Vaarama, Dr. Antero; Maatalouskoelaitos, Piikkiö, Finland — Genetical and cytological investigations, especially of *Ribes nigrum;* phytogeography.

Vartiovaara, Dr. V.; Botanical Institute of the University, Unioninkatu 44, Helsinki, Finland — Plant physiology: various studies including the permeability of cells to heavy water and methyl alcohol, and the exchange of potassium and sodium between single cells of Algae.

Ve, Dr. Søren; Pihls Skole, Bergen, Norway — Natural woodlands and forest-limits of western Norway; ethnobotany of trees.

Vegis, Dr. A.; Universitetets Växtfysiologiska Institution, Uppsala, Sweden — Physiology of winter dormancy in *Stratiotes*.

Vik, Prof. Knut; Norges Landbrukshøgskole, Vollebekk, Norway—Agricultural plants.

Virgin, Lic. Henning; Botaniska Institutet, Stockholms Högskola, Stockholm, Sweden —Influence of light on plasma viscosity of plants.

von Euler — *see* Cleve-Euler, Astrid

von Krusenstjerna — *see* Krusenstjerna, Edvard von

von Rosen — *see* Rosen, Gösta von.

Waern, Lic. Mats; Universitetets Växtbiologiska Institution, Uppsala, Sweden — Taxonomy, distribution and ecology of Algae on the Baltic coast of Sweden.

Waldheim, Dr. Stig; Universitetets Botaniska Museum, Lund, Sweden — Plant sociology and pedology, in particular bog vegetation and moss communities of southern Sweden; European phytogeography; Musci.

Wanscher, Mag. J. H.; Kgl. Veterinaer- og Landbohøjskole, Rolighedsvej 23, København V, Denmark—Genetics of cultivated plants.

Waris, Prof. Dr. H.; Botanical Institute of the University, Turku (Abo), Finland — Plant physiology: various studies including calcium requirements of certain Algae.

Weibull, Kand. Gunnar; Weibullsholm, Landskrona, Sweden — Genetics of induced polyploids, etc., in *Dactylis;* cytotaxonomy.

Weimarck, Prof. Dr. Henning; Universitetets Botaniska Museum, Lund, Sweden — Taxonomy and distribution of South African vascular plants; phytogeography of southern Scandinavia, in particular the flora of the Province of Skåne (Scania).

Westergaard, Prof. Dr. M.; Universitetets Genetiske Laboratorium, Universitetsparken, København Ø, Denmark — Genetics; cytology.

Wexelsen, Prof. Dr. H.; Norges Landbrukshøgskole, Vollebekk, Norway — Genetics and breeding especially of Clovers.

Wiedling, Sten; Apotekarnas Kemiska Fabriker, Södertälje, Sweden — Plant physiology, especially nutrition of Algae.

Wiinstedt, Kons. K.; Universitetets Botaniske Museum, Gothresgade 130, København K, Denmark — Floristics especially of Denmark.

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Å, Ø, Ö, Þ (Th), etc., are placed in their *English* alphabetical positions.

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EUROPEAN HARE INTRODUCED INTO THE DISTRICT OF THUNDER BAY, ONTARIO[1]

A. E. ALLIN
Fort William, Ontario.

ALTHOUGH the Varying Hare (*Lepus americanus*) is abundant at the Canadian Lakehead, it is not considered a game species by local sportsmen. In the hope that conditions would prove satisfactory and that a new game species would be made available for fall and winter hunting it was decided that an attempt should be made to introduce the European Hare (*Lepus europaeus*) from Southern Ontario where it is commonly but erroneously known as the "jackrabbit".

A sum of fifty dollars was collected in 1941 by Colonel L. S. Dear of Port Arthur from sportsmen of Port Arthur and Fort William. A source of supply was located near Meaford but it was found that hares could be readily trapped only in winter and it was not until March, 1942 that the first ten pairs were procured. These animals were released eight miles west of the Lakehead cities in McIntyre Township in an area which was cleared and under cultivation and which was believed suitable for the needs of the animals. Eight more were obtained on February 2, 1943. Four were released in the above area but the remainder were held in pens for acclimatization. Some died in captivity but the others were subsequently released in the same general area.

In the spring of 1945, when the writer of this note was President, the Thunder Bay District Fish and Game Association decided more hares should be introduced and 72 were secured from near Meaford. Since the snow was still deep, these animals were held in a large outdoor pen with the intention that they should be released at the advent of more clement weather. This move was disastrous: the terrified animals crowded into a heap in the corner of the enclosure and many either suffocated or died from fright. On March 3, we released 28 animals in Neebing Township, five miles south of the McIntyre site and across the Kaministiquia River. Eight more were released there on March 12. At least five of these 36 hares were found dead within the following few days. Possibly others suffered the same fate but from the observations which follow it will be seen that some of the animals survived.

Following the introductions of 1942-3, there were occasional reports of the hares being seen near the area of release. Young were observed in the spring of 1943 and on September 9, of that year I saw a European Hare at Murillo, (four miles distant), which I estimated would weight five or six pounds. On October 8, 1949, an animal of this size was shot in fields adjacent to Fort William and not far from the site of the releases in 1942 and 1943. Meanwhile, there were reports of their occurrence in Neebing Township. Several were noted in 1947 and at least two were killed by speeding automobiles in the spring of 1948. One of these hares weighed ten pounds when it was dressed. A hare was reported in the area in the fall of 1948 and another in 1949. In October, 1949, a hare was seen eight miles from the nearest point of release.

Dymond (1922) recorded the introduction of the European Hare (*Lepus europaeus*) into Ontario — seven females and two males which had been procured from Germany and placed on an island in the Grand River near Brantford whence they escaped across the ice to the mainland during the winter of 1912-13. By 1928, they had reached Penetanguishene (Saunders, 1932). By 1932, they had spread eastward at least to Darlington Township, Durham County (Allin, 1941). Downing (1948) reported them present in 1948 at Burk's Falls, Parry Sound District. Burt (1946) stated they were "rare as yet" in the Upper and Lower Peninsula of Michigan where they had spread from Ontario.

Dymond based his identification of the hares introduced into Southern Ontario on two specimens from Brantford received at the Royal Ontario Museum of Zoology. Miller (1923) referred the Ontario animals to the race *L. e. europaeus* Pallas. Anderson (1946) also referred specimens in the National Museum of Canada Collection to this race.

[1] Received for publication February 23, 1950.

Other recent authors have followed the same custom. It does not appear that systematic studies have been carried out on specimens from this continent, and it is possible that the basis for referring the Ontario animals to this race is the assumption that the original Ontario animals originated in the range of *L. e. europaeus* in Europe.

It would now appear that the European Hare has been successfully introduced into the Lakehead area of the Thunder Bay District of Ontario. Whether they will multiply and achieve the purpose for which they were introduced remains to be seen. In Southern Ontario their winter food includes large amounts of winter wheat and rye but they have advanced beyond the area where these crops are commonly raised, and are now occupying the southern limits of the Canadian zone of the Boreal region. The local area also lies in the latter zone, and there is no logical reason why conditions here should not prove to be equally satisfactory. This hare is an animal of open country and a limiting factor in its local spread may be the relatively small areas which have been cleared of the original forest. Most of the cleared land lies in the Great Lakes - St. Lawrence Forest Region (Halliday, 1937) a narrow belt of which extends along the American border from Lake Superior into Eastern Manitoba, including the lower valleys of the Kaministiquia, Pine and Pigeon Rivers and it is here that conditions should prove most favourable, and it was for that reason that the introductions were originally made in McIntyre and Neebing Townships. To the west and south, into Minnnesota, their spread will be handicapped by unbroken forest. North and east of Port Arthur lies in Halliday's Lake Superior Section of the Boreal Region. Its extensive forests of spruce and balsam, poplar and white birch will probably prove unsuitable but it is possible that stragglers may find their way into the small islands of farm land and occupy them in future years.

The introduction of a foreign species into a new land is always fraught with danger. Dymond *(loc. cit.)* and Anderson (1923) reported damage to crops by these animals shortly after their escape in southwestern Ontario. Subsequently, however, there have been few complaints of extensive destruction caused by the hares. They have provided excellent hunting and the revenue accruing directly and indirectly from that sport as well as the pleasure derived by the shooting parties probably compensates for any destructive tendencies they may have.

In view of the type of farming carried out in Thunder Bay District, I would anticipate even less danger of the hares proving to be destructive to local farmers although there might be instances of losses by individual market gardeners. There has been no evidence produced that the Ontario animals harbour diseases which would be spread to our native species.

SUMMARY

European Hares from the Meaford area of Ontario were introduced into the Lakehead area of Thunder Bay District, Ontario, in 1942, 1943 and 1945.

Some of these animals survived and apparently multiplied as they have been noted over a considerable area and several have been killed.

Should they continue to multiply they will provide a new sport for local hunters — the purpose for which they were introduced.

At present, there would appear to be slight danger attached to the introduction of this foreign species.

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NOTES AND OBSERVATIONS

Marine sunfish, *Mola mola* (Linnaeus) from the lower St. Lawrence.
Photo : Wallace Pollock.

Mola mola (Linnaeus) **from the lower St. Lawrence.** — On October 13, 1949, a specimen of the marine sunfish, *Mola mola* (Linnaeus), was received at the Department of Zoology, McGill University. The fish had been seen some 10 days before that date by Mr. Arthur Mathewson, K.C., on the beach at Metis Beach, Matane County, Quebec, and it was through the good offices of Mr. Mathewson that it was sent to McGill for identification.

The specimen measured four feet from snout to tail, and was in an advanced state of decay by the time the writer, together with Mr. Donald Cleghorn of the Redpath Museum, undertook the preliminary work on it in an effort to make a skeletal preparation. The skeleton is only partially ossified, so so that skeletal preparation may be difficult.

Mola mola is a pelagic fish found in most temperate and tropical waters. It is also seen fairly frequently close to shore in tropical

and subtropical regions, and occasionally in the temperate zones. Jordan and Evermann (1898) gave its Atlantic and Pacific distribution as "Common northwand to England, Cape Cod, and San Francisco". In more recent years, however, no doubt following the increase in Gulf Stream influence, it has been seen in Nova Scotia, where it is reported to be fairly common in the Bay of Fundy region and in the waters round Cape Breton Island. The present writer has heard rumours, unconfirmed, of its occasional presence in the Baie des Chaleurs; its appearance as far up the St. Lawrence as Metis Beach, however, appears to be a new record.

Reference: Jordan, D. S., and B. W. Evermann, 1898. The fishes of North and Middle America, Part II: 1753-55 — M. J. DUNBAR, Department of Zoology, McGill University, Montreal.

Partial Albinism in the Bronzed Grackle (*Quiscalus quiscula versicolor*). — On June 12, 1948, I noticed an abnormally plumaged grackle in a group of five moving along the shore of Lake Sasajewan, Algonquin Provincial Park. It was noted to have white tail feathers, white feathers in each wing and perhaps some white on the head. The bird appeared to be a well-grown young in a family of two adults and three young. The other birds in the group were normally plumaged.

Almost a year later, on May 29, 1949, Mr. E. M. Hagmeier observed a similarly plumaged bird where several pairs of grackles were nesting in an abandoned saw-mill at the west end of the Lake of Two Rivers, two miles distant from Lake Sasajewan. There seems little doubt that this was the same bird I had seen the previous year.

On June 2, Mr. Gordon Bennett found the nest of this bird, which proved to be a female. The nest contained five young whose feathers had grown out about one quarter of an inch to half an inch from the sheaths. From the standpoint of genetics, it was interesting to find that one of the five showed partial albinism, but the other four appeared normal.

On June 8, Bennett and I revisited the nest site, which was on a cross-beam on the second story of the ruined mill. The young had left the nest but the female was observed nearby, feeding dragonflies to one of the normally plumaged young. The female was studied carefully from a distance of about 50 feet. The tail feathers were all white except for the two outermost ones on the left side. There was a narrow ring of white feathers about the nape of the neck. At rest, two rectangular white patches showed near the leading edge of each wing; in flight, the greater primary coverts appeared to be white. A rather large patch of white covered the lower abdomen between the legs.

While we were examining the nestlings in another nest, one of them flew from the nest and disappeared directly into a dark hole some 60 or 70 feet away. This hole proved to be formed by the mouth of a disused well. While retrieving this bird from the water, Bennett came across the body of a young partial albino bird, presumably the same one he had seen in the nest the week before. It had apparently fallen in shortly before our arrival, for it was still fresh and in good condition. The skin is now in the Royal Ontario Museum of Zoology.

The distribution of white feathers on this young bird was very similar to, but not identical with, that of the female parent. Patches on the neck and lower abdomen were the same, but the two outer tail feathers were normal on each side, only the central ones being white. White wing feathers also differed in position and were not bilaterally symmetrical on the bird itself. Some of the primaries of the left wing showed albinism, as did the greater primary coverts of the right wing. The scales and claws also were albinistic and there were some traces to be found on the bill and the inside of the mouth. The eyes appeared normal.

The arrangement of white feathers in the tail in both adult and juvenile resembles that of a bronzed grackle collected in Oklahoma in 1938, by Harmon (*Auk*, 56:481) in which the three outer tail feathers were normal and the remaining central ones white.

As far as is known, the adult female survived the summer and may well be reported in migration or in winter quarters, for it is a bird of uncommonly striking appearance. —W. W. H. GUNN, *Division of Research, Ontario Department of Lands and Forests.*

REVIEW

Shrubs of Michigan. *By Cecil Billington. Cranbrook Institute of Science, Bulletin No. 20, second edition, 1949; pp. I - VII, 1 - 339, 3 colour-photo plates, 207 figs. Price, $4.50 (U.S.A.), cloth.*

This book should prove a most useful manual for the serious naturalist interested in the accurate identification of shrubby plants. While designed to include only the 207 species of the State of Michigan, its treatment is applicable to the great majority of shrubs to be found in Eastern Canada, especially those in the adjacent portions of Ontario from Lake Erie to the head of Lake Superior.

"Shrubs" are considered in the broadest sense. Thus we see included along with the willows, brambles, blueberries and honeysuckles, such vines as greenbriar, clematis and grape and even some dwarf semi-herbaceous species as trailing arbutus, wintergreen and twinflower. Difficult groups such as *Salix, Ribes, Rubus, Rosa, Crataegus, Amelanchier, Vaccinium* and *Sambucus* are admirably treated from a systematic point of view. Only in *Rubus* and *Crataegus* is the treatment restricted to the better defined species or to the characteristic representatives of generic sections. There is considerable improvement over the first edition published in 1943.

Keys for identification, detailed descriptions, finely executed drawings and current botanical names are given for all species. The small distributional maps, inset throughout the text, indicate the counties in which the plants occur. A pictorial glossary, the meanings of specific names, and a list of author's names are other useful features. The author's notes presented as though he were speaking with the plant actually in front of him, give a delightful personal touch and prevent the dullness which might otherwise creep into such a handbook. In all, *Shrubs of Michigan* maintains the fine tradition of the other Cranbrook Publications on orchids, ferns, mushrooms and other aspects of the flora of the State, — W. G. DORE.

The Second Annual Report of the Severn Wildfowl Trust, The New Grounds, Slimbridge, Gloucestershire, England, 1948-1949. *133 pp., 1 map, 41 photographs, numerous drawings.*

The remarkable collection of living waterfowl maintained by the Severn Wildfowl Trust is described as containing some 654 individuals of 106 species and subspecies. These are listed (pp. 36-42) with brief annotations.

There is a variety of information on waterfowl in the report with notes on behaviour, plumages, banding and trapping, the sense of smell, pathological observations and information derived from the study of the living collection or from the wild waterfowl that visit the grounds in numbers. There is an annotated list (pp. 19-24) of birds of all kinds recorded on the grounds in the period January 1948 to April 1949. Numerous drawings and sketches add to the attractiveness and value of the report. A 24-page photogravure section contains excellent pictures of waterfowl and of aspects of the waterfowl grounds.

A very interesting and useful adjunct to this report is the 47-page "Key to the Wildfowl of the World" by Peter Scott. Lithograph drawings illustrate 240 forms of swans, geese, and ducks in male and female breeding plumage. Among similar species and subspecies distinguishing characters are given. Distributions are succinctly outlined. The author-artist is eminently qualified to prepare such a key, inasmuch as he has observed in life a large number of the forms shown; and the numerous notes on colors of 'soft parts' as well as the proportions and postures of the drawings are therefore particularly authentic. This useful key may be purchased in booklet form for two shillings and sixpence from the Severn Wildfowl Trust. — W. EARL GODFREY.

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The Canadian Field-Naturalist

Vol. 64 OTTAWA, CANADA, JULY-AUGUST, 1950 No 4

PLANTS COLLECTED IN THE DUNDAS MARSH, HAMILTON, ONT., 1946[1]

W. W. JUDD

McMaster University, Hamilton, Ontario.

THE FOLLOWING is a list of plants collected in the Dundas Marsh, Hamilton, in the summer of 1946, in the course of an ecological survey of the region sponsored by the Research Division, Department of Lands and Forests of Ontario and McMaster University.

The author wishes to acknowledge gratefully the aid of Professor M. L. Fernald, Gray Herbarium, Harvard University, who kindly identified the species of the genus *Potamogeton,* Dr. J. H. Soper, Department of Botany, University of Toronto, who identified species of the genera *Polygonum, Sparganium* and *Myriophyllum,* Mr. W. Dore, Department of Botany, Ontario Agricultural College, who identified the Gramineae and various Cyperaceae and Dr. F. J. Hermann, Plant Industry Station, U.S. Department of Agriculture, Beltsville, Md., who identified various Cyperaceae and Juncaceae. Specimens retained by Mr. Dore for the herbarium at the Ontario Agricultural College are marked (*); specimens retained by Professor Fernald for the Gray Herbarium are marked (†). All other specimens are retained at McMaster University. The writer is grateful to Messrs. L. Wragg, E. Kay and E. Turner, students of McMaster University, who aided in making the collections.

The Dundas Marsh (see fig. 1) lies adjacent to the northern limits of the city of Hamilton. It is traversed through most of its length by the disused Desjardins Canal which originates in a turning basin, at its west end, near the town of Dundas. At its eastern end the canal opens into a body of open water with average depth of four feet. The water of the marsh empties into Hamilton Bay through a short canal. The map has been traced from a series of aerial photographs kindly supplied by Professor J. W. Watson of the Department of Geography of McMaster University.

HEPATICAE

Ricciaceae

Ricciocarpus natans (L.) Corda
Riccia fluitans L.

PTERIDOPHYTA

Polypodiaceae

Onoclea sensibilis L.

Equisetaceae

Equisetum fluviatile L.

SPERMATOPHYTA

Typhaceae

Typha latifolia L.

Sparganiaceae

Sparganium eurycarpum Engelm.
Sparganium chlorocarpum Rydb.

Najadaceae

†*Potamogeton pectinatus* L.
†*Potamogeton nodosus* Poir.
†*Potamogeton crispus* L.
†*Potamogeton zosteriformus* Fern.
†*Potamogeton foliosus* Raf. var. *macellus* Fern.
†*Potamogeton Berchtoldi* Fieber var. *acuminatus* Fieber
†*Potamogeton perfoliatus* L.

Alismaceae

Alisma Plantago-aquatica L.
Sagittaria latifolia Willd.

Hydrocharitaceae

Anacharis canadensis (Michx.) Planchon

Gramineae

Calamagrostis canadensis (Michx.) Nutt.
Phalaris arundinacea L.
Glyceria striata (Lam.) Hitch.
**Glyceria maxima* (Hartm.) Holmb.

[1] Received for publication October 9, 1947.

Vol. 64, No. 3, May-June, 1950, was issued July 27, 1950.

Phragmites communis Trin. var. *Berlandieri* (Four.) Fern.
Hystrix patula Moench

Cyperaceae

Eleocharis calva Torr.
Carex diandra Schrank
Carex substricta (Kükenth.) Mack.
Carex Pseudo-Cyperus L.
Carex versicaria L.
Carex stricta Lam. var. *strictior* (Dewey) Carey
Carex cristatella Britt.
Carex vulpinoidea Michx.
Scirpus atrovirens Muhl.
Scirpus validus Vahl

Araceae

Calla palustris L.
Acorus Calamus L.
Symplocarpus foetidus (L.) Nutt.

Lemnaceae

Spirodela polyrhiza (L.) Schleid.
Lemna minor L.
Lemna trisulca L.
Wolffia columbiana Karst.

Juncaceae

Juncus tenuis Willd.
Juncus tenuis var. *Dudleyi* (Wieg.) Hermann

Dioscoreaceae

Dioscorea villosa L.

Iridaceae

Iris versicolor L.

Polygonaceae

Polygonum coccineum Muhl. forma *natans* (Wieg.) Stanford
Polygonum natans Eaton forma *Hartwrightii* (Gray) Stanford
Polygonum natans Eaton forma *genuinum* Stanford
Polygonum punctatum Ell.
Polygonum scabrum Moench.

Ceratophyllaceae

Ceratophyllum demersum L.

Nymphaeaceae

Nymphaea odorata Ait.
Nuphar advena Ait.

Ranunculaceae

Ranunculus sceleratus L.
Ranunculus pennsylvanicus L.
Anemone canadensis L.
Caltha palustris L.

Crucifereae

Rorippa palustris L.

Crassulaceae

Penthorum sedoides L.

Rosaceae

Potentilla palustris (L.) Scop.
Potentilla Anserina L.

Balsaminaceae

Impatiens biflora Walt.
Impatiens pallida Nutt.

Lythraceae

Decodon verticillatus (L.) Ell.

Onagraceae

Epilobium hirsutum L.
Epilobium adenocaulon Haussk.

Haloragidaceae

Myriophyllum verticillatum L.

Umbellifereae

Cicuta bulbifera L.
Sium suave Walt.

Cornaceae

Cornus stolonifera Michx.

Primulaceae

Steironema ciliatum (L.) Raf.
Lysimachia Nummularia L.

Apocynaceae

Apocynum cannabinum L.

Asclepiadaceae

Asclepias incarnata L.

Verbenaceae

Verbena hastata L.
Verbena urticaefolia L.

Labiatae

Mentha arvensis L.
Lycopus americana Muhl.
Scutellaria galericulata L.

Solanaceae

Solanum Dulcamara L.

Scrophulariaceae

Mimulus ringens L.
Chelone glabra L.
Veronica americana Schwein.

Lentibulariaceae

Utricularia vulgaris L. var. *americana* Gray

Phrymaceae

Phryma Leptostachya L.

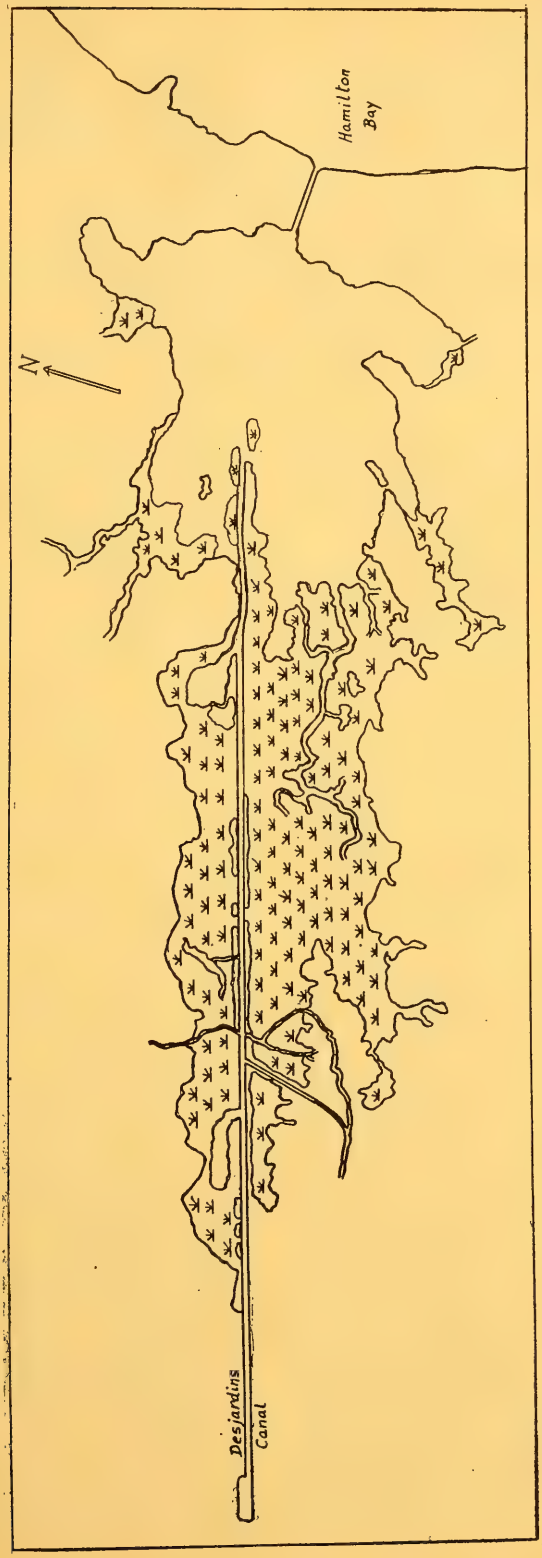


Fig. 1. Map of Dundas Marsh near Hamilton, Ont.

Caprifoliaceae
Sambucus canadensis L.

Cucurbitaceae
Echinocystis lobata (Michx.) T. & G.

Campanulaceae
Campanula aparinoides Pursh

Lobeliaceae
Lobelia siphilitica L.

Compositae
Eupatorium purpureum L.
Eupatorium urticaefolium Reichard
Eupatorium perfoliatum L.

THE FAUNA OF THE ROYAL BOTANICAL GARDENS, HAMILTON, ONTARIO [1]

A. EMERSON WARREN, Ph.D.
McMaster University

AN ACCOUNT of the fauna of the "Royal Botanical Gardens" region will of necessity be incomplete, in that there are few published statements to which to refer. Data concerning the abundance and variety of animal organisms are limited to personal observations and to verbal information gleaned from naturalists and other persons familiar with the life within the area. With the exception of the resident and migratory birds, the natural history of the region is vaguely understood and considerable knowledge must be gained before a constructive program of conservation and wildlife management can be successfully carried out.

The Royal Botanical Gardens, which include the region known as Coote's Paradise, afford many interesting examples of the close relationships that exist between a terrestrial and an aquatic habitat. For convenience, we may define the life zones here as shore and marsh on the one hand, and woodland, meadow or upland on the other. However, these classifications are arbitrary, since the ranges of many organisms overlap and sharp delineations of habitat cannot always be made. The aquatic zone includes the entire marsh region and an arm of the bay extending beyond Valley Inn. The land area completely surrounds the marsh and extends on the northwestern side over upland slopes of the Dundas escarpment, thus comprising in all about 1,800 acres.

In a general sense, the fauna of this region resembles that of adjoining stretches of southern Ontario. The location of the Gardens, at the western end of Burlington Bay, implies that much of the aquatic life is similar to that found elsewhere along the northwestern shore of Lake Ontario. The immediate proximity to the Niagara Peninsula suggests a land fauna considerably influenced by the conditions peculiar to this specialized environment. The peninsula is a funnel through which pass many forms of migratory life, and the Botanical Gardens and marshes afford sanctuary to a great many species of birds of passage. The restrictions on hunting and shooting within the area have afforded considerable protection to our feathered visitors and have encouraged many to nest or become residents of the region. Regulations in themselves, however, are not sufficient guarantee for birds to remain in a place for long periods. There are other considerations, and the assurance of adequate food supply and protection against natural enemies are quite essential.

Many forms of animal life no longer in evidence used to flourish in this part of Ontario. Overfishing, overhunting and overtrapping in earlier years have taken their toll of life indigenous to this locality. But, in addition, the encroachments of civilization with the resultant clearance of woodlands for agricultural or other purposes, the development of modern highways, and the expansion of industry with its many complicating conditions have tended to render the place uninhabitable for many types. To illustrate, salmon, trout and sturgeon have not been taken in these waters for many years. The passenger pigeon is extinct and the wild turkey has vanished from the area. Bob white quail and ravens no longer frequent these regions, and several other forms rarely appear. Bears, martens, otters and beavers have not occurred here in many decades, although there are occasional re-

[1] Received for publication December 1, 1948.

ports of bears and otters having been seen in the general vicinity. We may not anticipate the return of any of these forms today, but we can help to maintain an environment favourable for the perpetuation of the species that still remain in the district. Some forms which formerly flourished occur today in depleted numbers, while other species seem to have increased far beyond what might be regarded as normal. Skunks, common rats and meadow mice thrive in an environment fostered by man, and tend to crowd out other denizens. Starlings and English sparrows, lacking normal controls, exert very unfavourable influences upon other bird life. The German carp, in the absence of many former competitors, is detrimental to other fishes. Of course there are annual fluctuations of population numbers in many species, and these differences often occur in predictable cycles. But one essential at least for species survival in an area is the maintenance of a normal balance of nature. In regions under the control of an authority, therefore, wise management is necessary for the perpetuation of this balance.

There are no fewer than twenty-five species of mammals in this locality. Racoons, skunks, star-nosed moles, short-tailed shrews and cinereous shrews are common. Most of these are either nocturnal or fossorial in their habits, hence they are not ordinarily observed by daytime visitors. There are no good bat caves in this area, but the little brown bat is frequently observed and the big brown bat more rarely. Black and gray squirrels, Eastern chipmunks, woodchucks, white-footed or deer mice, meadow mice, muskrats and cottontail rabbits all are quite abundant. The European hare (erroneously called the jack rabbitt) also occurs, though less frequently. The New York weasel is present, and the mink occasionally. Red foxes are quite common. The brush wolf has been reported on occasion, although there are few authenticated records. Evidences of its occurrence have been based almost wholly upon reports of howls heard in the vicinity. White-tailed deer are found north of the canal and deer tracks are seen occasionally in the ravine behind the University. These animals would probably be more abundant if there were a larger stand of cedars present.

An enumeration of the birds of the locality would make a sizeable list. The variety of habitat within the Royal Botanical Gardens area invites a wide variety of birds to feed or breed there. The marsh in particular is an oasis for much bird life. In general, the area supports a bird population equal to or exceeding that of any comparable situation in this latitude. Under the auspices of the Hamilton Nature Club census surveys are made at regular intervals and fair estimates on species and population numbers have been obtained. There are now at least two hundred and sixty-seven recorded species, ninety-three of which are aquatic and shore birds and one hundred and seventy-four are of meadow and woodland. With respect to residence, nineteen species are present throughout the year, thirty others are northern forms remaining during the winter, ninety-two species are summer residents especially during the nesting season, one hundred and two are transients or birds of passage which spend briefer or longer periods en route, and there are twenty-four species which occur but rarely. The environs of Hamilton constitute a bird lover's paradise. Here we find the horned lark, the meadow lark, the bobolink, the oriole, the cardinal and the scarlet tanager, the robin and the wren, the blue heron and the Florida gallinule, the red-winged blackbird, black ducks and plovers and dozens of other species. Who has not thrilled to the notes of the wood thrush and the veery, the indigo bunting and the white-throated sparrow? The songs emanating from the ravine in springtime comprise a veritable woodland symphony.

Local reptiles consist of snakes and turtles. The blue-tailed skink, the only lizard in Ontario, occurs around Lake Erie. This species has not been reported here, although it has been found near Smithville. There are eight kinds of snakes in this locality. The garter snake, the milk snake, the little brown (De Kay's) snake, and the water snake are fairly abundant, but the ribbon snake, the red-bellied snake, the smooth green snake and the ring-necked snake are rare. The hog-nosed snake or blowing adder is not known here. None of our snakes is poisonous, but all are useful in controlling rodents and insect pests. De Kay's snake and the ring-necked snake are sometimes mistaken for copperheads and, unfortunately, killed, but there are no copperheads in this area.

The snapping turtles and painted turtles are the commonest. The former are often accused of destroying young ducks and other waterfowl, but these turtles feed on small fish, frogs, snails, crayfish, insects and in fact any kind of small animal, living or dead, that may come within range of their jaws. Painted turtles, with their prettily marked carapaces, are frequently seen sunning themselves on logs. The map turtle is a fairly large species. It is found in this vicinity although its range is more southerly and it is not as hardy as the others. Blanding's turtle, which occurs around Lake Erie, rarely is found here. The musk turtle and the soft-shelled turtle have only local distribution, being found in one pond at the end of the bay near Valley Inn.

Among tailed amphibians, Jefferson's salamander and the spotted salamander are common. These hide in decaying logs or under stones during the day, but move about at night. In early spring they move towards ponds or pools where they lay their eggs. The crimson-spotted newt, with its eft or land stage, is widely distributed. The common mudpuppy, *Necturus,* with its feathery gills, spends its entire life in the water. It is common in Desjardins Canal, and is found under stones in nearby brooks. The red-backed salamander, *Plethodon,* on the other hand, is exclusively a terrestrial form. It is found under logs or stones almost anywhere in the district. Its young never pass through an aquatic stage.

The spring peeper (Pickering's hyla), with its shrill notes, is an early harbinger of spring. It is one of the commonest of our tree-frogs. It is usually preceded by the swamp tree-frog. The tree-toad, on the contrary, comes very late, at about the same season as the bullfrog. The wood frog is the first of the pond frog group to arrive. It is not very common in this locality, although it occurs widely in the province. The leopard frog and the green frog are very common. The pickerel frog occurs less frequently. The bullfrog is practically gone, due largely, no doubt, to its having been fished too much. An attempt is being made at restoration of this species in one large pond near Dundas. The common American toad is well known to everyone.

There are many kinds of fishes in the marsh and bay regions. Few are good game fishes, and none has particular commercial significance. Carp and suckers, which are caught for food, are plentiful and attain considerable size. Bowfins and pike are present in fair numbers, the latter often being fished through the ice. Occasionally anglers have a try at perch, sunfishes, crappies and rock bass, but the better types of sporting fishes have either been crowded out or conditions are no longer favourable for their existence. Catfishes are common and their capture affords some sport. Lampreys are found in the bay and in nearby streams and brooks. The common eel, which at times abounds near Burlington Beach, is also detected in the marsh area. There are numerous smaller fishes; sticklebacks, shiners, creek chub, mud minnows, red-sided dace and johnny darters all occur in brooks and streams and in the waters roundabout.

There is a large invertebrate fauna represented by several phyla. Worms and leeches are common. Numerous molluscs, especially snails, occur both in water and on land. Crayfish and gammarids are found in ponds and streams, and minute crustacean forms abound in marsh and pond everywhere and furnish very important elements of fish food. Many species of spiders are found in this locality. But the greatest variety and population exist among the insects. While records of insect life are not specific for this particular region, it may safely be assumed that there are no fewer than one thousand species here. A detailed study will undoubtedly reveal more nearly twice that number. Of all these creatures, possibly no other insect is more obnoxious than the common culex mosquito. In the Westdale and Dundas regions it is a serious pest. The pleasurable use of the Gardens is much restricted by its presence, but definite control measures are now being developed to help rid the place of this nuisance.

The Royal Botanical Gardens and environs afford a panorama of singular beauty. This beauty could be enhanced by the removal of certain unfavorable features. The waters of Coote's Paradise could become a sanctuary unrivalled in this province. Vast flocks of waterfowl passing to and fro can always find harbour in this locality. That more birds do not settle here might well be due to the several conditions which interfere with the development of the plant and other aquatic life upon which they feed. There is the problem of pollution of the bay and marsh. Much drainage into the marsh is very detrimental and there should be proper

diversion of sewage. Many forms of life are impaired or destroyed by such contamination. Other controlling measures appear necessary. The dredging of the Desjardins Canal would permit a runway for many species of the desirable fish.

The netting of large carp is an important and necessary requirement of good fishery management. Carp are bottom feeders, and although their diet consists mainly of insects and aquatic vegetation, they have the undesirable habit of tearing up plants at their roots and of churning the bottom deposits, thus greatly increasing the turbidity of the water and rendering conditions very unsuitable for the spawning and nesting of other fish. The control of the carp population, although a very difficult problem in view of the rapid increase and hardy nature of this species, would help to maintain a better balance of nature and thus contribute to the establishment of more desirable species of fish.

Any long-range program for the development of a sanctuary, such as the Royal Botanical Gardens, must depend upon a thorough knowledge of food-chains and other controlling factors of the local environment. A systematic detailed study of the life of this region is essential. An ecological research program involving Wentworth County and surrounding areas has been initiated at McMaster University, under the auspices of the Research Council of Ontario, and is now in progress.

DEFENSIVE BEHAVIOR IN THE MANTIS[1]

MAE HALLIDAY
25 LeMay Rd., Toronto.

TOWARD the end of August, 1949, a male praying mantis (*Mantis religiosa* Linn.) turned up in our garden and we transferred it to a screened observation box. With us at the same time was an immature bay-breasted warbler which had been injured when it flew against a school window.

Prompted by curiosity I cautiously placed the mantis inside the bird cage. Hardly had I withdrawn my hand when the mantis went into action. It took a firm stand on the twig and started to sway from side to side. At the same time it fanned out both upper and lower wings in the vertical plane. The addomen was raised and turned back between the wings. The cerci were rubbed against the inside of the wings making a dry sound like a person's fingers being rubbed firmly and quickly across the surface of paper.

The forepart of the body of the mantis, though held rigid, was twisting and turning sharply. The eyes never left the bird and the front legs were raised, not in the usual praying position, but turned outward with the inner surfaces facing forward, exposing the pair of eye-like spots[2].

M. religiosa appears to be exceptional among mantids in its possession of these spots on its forelegs and here the spots were apparently being used for their real purpose, that of disconcerting an enemy or, in other words, as part of a defensive reaction.

The warbler took several pecks at the mantis but seemed puzzled and finally withdrew a short distance while looking sharply and curiously at the mantis which still held its fierce pose and kept changing the position of its front legs, or arms, by holding first one in the air and then the other, reminding me of a spider monkey. This kept up for an hour when I concluded the mantis had had enough excitement. As I attempted to pick the mantis up he fought my fingers and even after I had returned him to the observation box he would assume a fighting attitude at the least movement of my fingers.

He held this position for about 20 minutes when he relaxed and went about nonchalantly

[1] Received for publication October 27, 1949.

[2] For the benefit of those who may be interested in technical details in connection with Mrs. Halliday's observations on the defensive behaviour of Mantis religiosa, the following notes are submitted:

The eye-like spots on the front legs consist each of a pale central spot and a surrounding dark area. They are situated on the inner or mesal surface of the elongated fore coxae and are usually concealed, since in the ordinary position of the coxae these surfaces are almost contiguous. In the defensive attitude the coxae are rotated outwards so that the inner surfaces are directed forwards. The femora are tightly flexed upon the coxae and each femur bears a small pale spot in alignment with the pale central areas of the coxal spots. — E. M. WALKER.

Praying Mantis (MANTIS RELIGIOSA Linn.)

grooming his war weapons and antennae. At no time could I get the mantis to go into action without the assistance of the bird.

A few days later I had the opportunity to repeat the observation with two cedar waxwings and four female mantids. I telephoned Prof. E. M. Walker and he and Mrs. Walker (Dr. Norma Ford Walker) soon arrived. Though the mantids were gravid they, too, were ready to "do or die". Prof. Walker remarked on the "amazing position of the forelegs."

This time the action was not as fast as in the case of the male mantis and the cedar waxwings were more interested in the berries we had for them to eat. However the female mantids definitely went through the same performance as the male and showed their dislike for the birds by attacking their feet and legs. The waxwings just looked down and shook off the mantids.

The following morning the Walkers returned. Dr. Norma brought along her motion picture equipment and we staged the spectacle over again. We also made a series of still photographs in black and white and also in colour.

BIRDS OBSERVED IN THE YUKON TERRITORY DURING THE SUMMER OF 1949 [1]

W. W. JUDD

McMaster University, Hamilton, Ontario.

WHILE EMPLOYED with the Northern Insect Survey sponsored by the Defence Research Board and the Department of Agriculture of Canada the writer had an opportunity of observing various birds in the Yukon Territory during the summer of 1949. On May 31 a few birds were noted at Watson Lake near the southern border of the territory and during the week of May 31 to June 6 observations were made at Whitehorse. During the remainder of June and in July the area in which observations were made was centred at Dawson which is located at the north-east corner of the junction of the Klondike and Yukon Rivers and is backed by the slopes of Moosehide Mountain (see map). Opposite the mouth of the Klondike River, on the banks of the Yukon River, are West Dawson and Sunnydale, two settlements consisting of scattered farms some of which are abandoned. Running westward from West Dawson is the Sixtymile Road. At irregular intervals along it are cabins used by travellers and at the 49-mile cabin the road forks, the right branch continuing on to Poker Creek in Alaska and the left branch to mining camps at Sixtymile.

The topography along the road is a series of rounded ridges intersected by deep valleys. Along the ridges are smooth-topped elevations locally known as "domes" and ranging from 3000 to 5000 feet in elevation. In the bottoms of the valleys are small, rapid, clear streams flanked by dense growths of willow 3 to 6 feet tall which give a distinct light green colour to the valley bottoms and which continue upward in light green streaks in the gulches between domes where water flows. The predominant shrub in the region is a dwarf birch. On the lower slopes the shrubs are 3 to 6 feet tall and become progressively shorter toward the crests of the domes where they may be a few inches tall. Along the slopes of the domes and crowding into the valleys are spruces in close growth. They are tallest at the bottom of the slopes while on the crests they are absent altogether or are represented by scattered dwarf trees often gnarled in appearance. To the east of the Yukon River is a region which presents much the same topography as the region to the west of the Yukon except that the valleys have extensive flats (e.g. Jensen Flats) bordering the creeks which run through them. The chief rivers are the Klondike and Indian Rivers into which flow various creeks e.g. Bonanza, Eldorado, Quartz, Hunker, Sulphur and Dominion Creeks. About the area are several domes, the highest being King Solomon Dome (elevation 4250 feet) which lies

[1] Received for publication October 27, 1949.

at the centre of the area and is flanked by a somewhat lower eminence, Hunker Summit. Along the roads following the creeks are settlements and mining camps such as Bear Creek, Sulphur and Rock Creek.

Colymbus auritus Linnaeus.

HORNED GREBE. One in breeding plumage was seen on June 18 in a pool in a sphagnum bog in Jensen Flats.

Charadrius hiaticula semipalmatus Bonaparte.

SEMIPALMATED PLOVER. Two birds were seen moving actively about shallow puddles along a roadside at Whitehorse on June 5; two were noted on June 19 along Sulphur Creek where hydraulic stripping operations had removed the upper layers of soil and had exposed layers of permanently frozen mud; two birds were seen on mud flats surrounding a pool near Bear Creek on June 21.

Totanus flavipes (Gmelin).

LESSER YELLOW-LEGS. A single bird was seen scolding excitedly about a bog on Jensen Flats on June 19. It would fly to the tip of a small, isolated spruce tree, remain there for a few moments with fluttering wings and fly off to another tree to repeat the performance as long as an observer remained in the vicinity.

Larus argentatus smithsonianus Coues.

HERRING GULL. These birds frequented the banks of the Yukon River at Dawson. Six were observed for about an hour on July 8 when they flew back and forth along the river near the ferry wharf, occasionally alighting on the water or dipping downward to snatch pieces of floating refuse.

Larus philadelphia (Ord).

BONAPARTE GULL. A single bird, with black head, flew overhead along the border of the airfield at Watson Lake on May 31.

Colaptes auratus luteus Bangs.

NORTHERN YELLOW-SHAFTED FLICKER. Two birds, with red bar on nape and yellow underwing, were in flight from tree to tree in Sunnydale on July 14. On July 21 in Dawson a young male was found calling and fluttering in the grass.

Sayornis saya saya (Bonaparte).

SAY PHOEBE. This phoebe was commonly to be seen about Dawson perched in trees and on corners of buildings. On June 22 a nest was discovered in Sunnydale. It was on a narrow shelf in an abandoned building and was constructed of grasses, feathers and several pieces of string. In the nest were seven downy young with eyes still closed. When an observer came close to the nest the parent birds swooped toward him clicking their bills. On July 8 a group of five juvenile birds were observed making trial flights about a woodpile and adjacent roofs of buildings in Dawson. At intervals the parents arrived and fluttering before the young birds, fed them insects as they teetered uncertainly on their perches.

Tachycineta thalassina lepida Mearns.

NORTHERN VIOLET-GREEN SWALLOW. These swallows were in flight about Dawson in June and July and they nested in holes in walls, in bird boxes and between rafters on the outside of buildings. A voluminous nest made of grasses was found in a ventilator on the side of a building on June 8 and contained three addled eggs. Several birds were in flight about Bear Creek on June 13.

Iridoprocne bicolor (Vieillot).

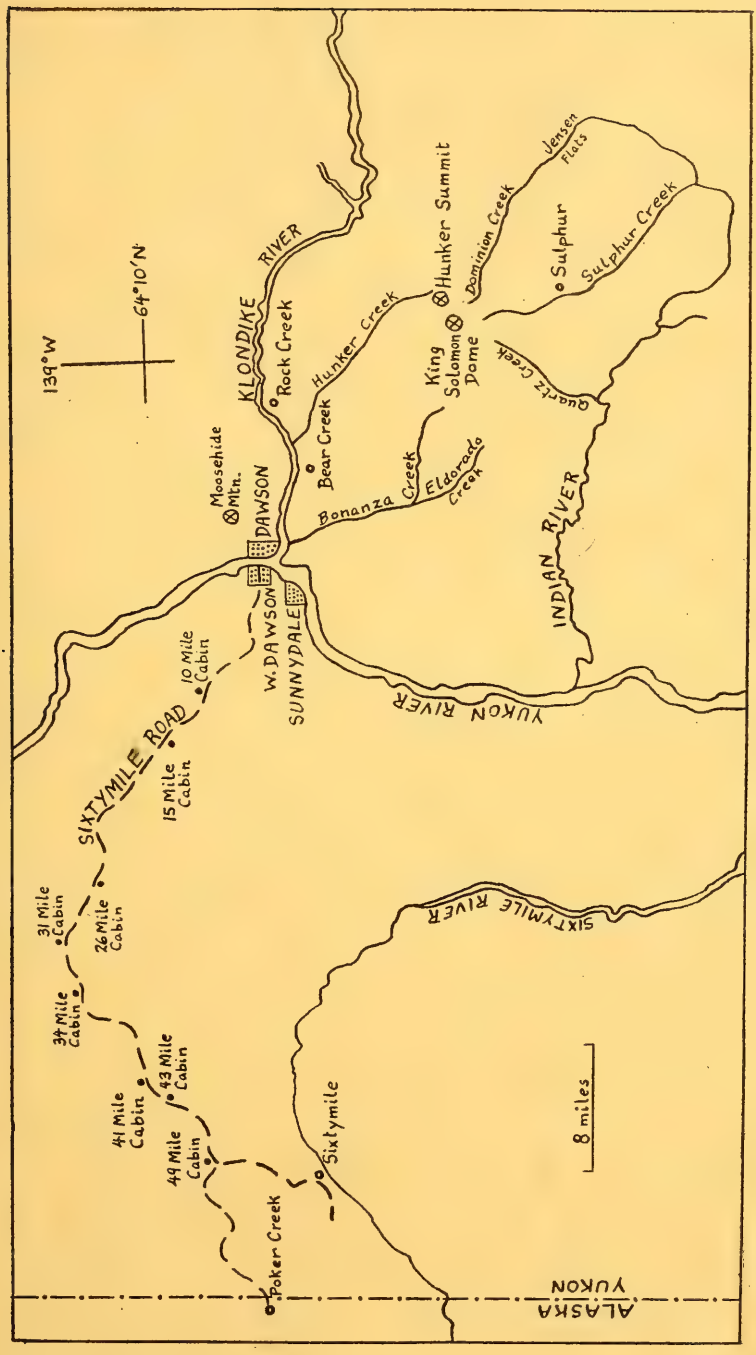
TREE SWALLOW. A few birds were seen swooping over the creek at Bear Creek on July 5.

Petrochelidon pyrrhonota hypopolia Oberholser.

GREATER CLIFF SWALLOW. These swallows were first seen on May 31 at Watson Lake where they were flying about the aircraft hangar. Later on the same day more birds were seen at Whitehorse where there were numerous nests beneath the eaves of buildings. In Dawson the birds nested beneath eaves and during June and July were in flight about the town, particularly over ponds and watercourses.

Perisoreus canadensis subsp.

CANADA JAY. Canada jays were encountered in wooded areas in the vicinity of Dawson. A single bird was seen in bushes on the slopes of Moosehide Mountain on June 17; 2 birds were seen squawking in trees at Mile 31 of the Sixtymile Road on June 26; one bird was noted in a tree on the road to Sunnydale on July 6; and several jays were fussing about in trees on the heights about Sunnydale on July 20. Two birds were noisy visitors at a tree stump where they fed on toast crumbs at Rock Creek on July 26.



Map of Dawson, Yukon Territory, and surrounding area.

Corvus corax principalis Ridgway.

NORTHERN AMERICAN RAVEN. Two were seen in flight along a cliff above Whitehorse on June 1. At Dawson they frequented the tops of cliffs along the Yukon River where they could be seen in wheeling flight. A bird was seen in flight along the bank of the Yukon River on June 10, and on June 11 one flew croaking across town. Two ravens feeding on scraps on a street in Dawson on June 14 were undisturbed by a passing truck. On June 15 two birds soared about the river bank at West Dawson. On June 13 two birds were seen in flight along a cliff above Bear Creek and at the same locality six ravens, congregated on the shoulder of the road on July 5, flew off when approached by a truck.

Parus hudsonicus subsp.

BROWN-HEADED CHICKADEE. A single bird was noted singing in a tree in a gully at Mile 31 of the Sixtymile Road on June 26.

Turdus migratorius migratorius Linnaeus.

EASTERN AMERICAN ROBIN. One robin was seen in a field at Whitehorse on May 31 and another was hopping about a field in Dawson on June 10. Robins were in flight over the tops of the birch scrub on the Sixtymile Road on June 26. On June 23 a young bird with spotted breast was located in a thicket along the Yukon River at Dawson.

Sialia currucoides (Bechstein).

MOUNTAIN BLUEBIRD. Two male birds were seen at Whitehorse, one in a field on May 31 and the other perched on a telephone wire on June 2.

Bombycilla garrula pallidiceps Reichenow.

AMERICAN BOHEMIAN WAXWING. Two birds were noted in a spruce wood at Whitehorse on June 3 and another pair was seen in a bush at the edge of the road through Jensen Flats on June 19.

Dendroica petechia subsp.

YELLOW WARBLER. The yellow warblers frequented the thickets of willow and poplar along the Yukon River at Dawson. They were first seen on June 10 when they were in song. On June 23 a nest was found in a crotch of a willow about four feet from the ground. It was composed of grasses and bits of soft paper and was lined with fluffy "down" from flowers of willow. In the nest were one egg and four young birds with little down and with eyes still closed. When the nest was first observed the female parent fussed about in the bushes and a few minutes later the male arrived and fed the young birds. Fifteen minutes later one of the parents was on the nest. On July 2 there were in the nest three well-feathered birds two of which fluttered out and scrambled along the ground.

Wilsonia pusilla subsp.

WILSON'S WARBLER. A black-capped male was seen in a spruce tree at the bottom of a gully at Mile 31 of the Sixtymile Road on June 26. It remained in sight at a distance of about forty feet for 15 minutes and then darted away among the trees.

Euphagus carolinus (Muller).

RUSTY BLACKBIRD. Two birds were seen scolding in a willow bush in a swamp in Dawson on June 23 and a single bird was noted in the same swamp on July 2.

Pinicola enucleator subsp.

PINE GROSBEAK. A male and female grosbeak were seen at the edge of the road through Jensen Flats on June 19 and another pair, male and female, was seen in a tree at Mile 3 of the Sixtymile Road on June 26.

Acanthis flammea flammea (Linnaeus).

COMMON REDPOLL. Five redpolls clinging to dandelion scapes were feeding on the seeds in Dawson on June 23 and four birds were engaged in the same activity in a field in Dawson on June 27.

Junco hyemalis hyemalis (Linnaeus).

EASTERN SLATE-COLOURED JUNCO. A junco was first seen in Whitehorse in song at the top of a telephone pole on June 4 and another was located in a tree in Dawson on June 10. During June and July they appeared frequently in bushes and along roadsides. On June 22 a nest was found at the side of the road between West Dawson and Sunnydale. It was on the ground beneath a clump of bearberry and contained five young downy birds with eyes still closed. On June 30 when I approached the nest the five birds scrambled out of it and away into the surrounding bushes. Five hours later the nest was examined and was empty.

Zonotrichia leucophrys gambellii (Nuttall).

GAMBEL WHITE-CROWNED SPARROW. This sparrow was one of the birds of commonest occurrence about Dawson during June and July, being noted first on June 10. The

birds could be seen in bushes and trees about Dawson and were encountered throughout the wooded parts of the country surrounding the town.

Passerella iliaca subsp.

FOX SPARROW. Three fox sparrows were flitting about in bushes and on the ground near Sulphur on Sulphur Creek on June 19.

NORTHERN BREEDING WATERFOWL SUMMERING AT NIAGARA FALLS[1]

R. W. SHEPPARD
Niagara Falls, Ontario

THROUGHOUT a three months period from June 16 to September 15, in the summer of 1949, the broad waters of the lower Niagara River immediately below the Falls harboured a most unusual congregation of waterfowl which under normal circumstances it would seem should have been occupied in breeding activities on far-a-way northern lakes, or western prairie sloughs.

On June 16, there was present, chiefly around a group of small rocky islets on the Canadian side of the river midway between the Maid-of-the-Mist docks and the H.E.P.C. generating station, the following collection of waterfowl:— Common Loon *(Gavia immer)* 2; Horned Grebe *(Colymbus auritus)* 2 in breeding plumage; Golden-eye *(Glaucionetta clangula)* 4 males and 2 females; Canvas-back *(Nyroca valisneria)* 2, apparently females; Gadwall *(Chaulelasmus streperus)* 1 female; Mallard *(Anas platyrhynchos)* 2 males and 1 female; Black Duck *(Anas rubripes)* 3. On June 23, in the same general area, there were present 3 Loons, two of which were in full breeding plumage, while the other appeared to be in a transition stage. At the same time the 6 Golden-eyes were again observed, but only one Horned Grebe was noted. Two days later, on June 25, the 3 Loons, the 6 Golden-eyes, the female Gadwall, and the Black Duck were present. On July 2, with the duck population as on June 25, only one Loon was found; but on July 5 there were present in the area no less than 4 Loons, three in breeding plumage and one in a transition stage; with 2 Horned Grebes, the 6 Golden-eyes, the Gadwall female, and the two Black Ducks.

Due to absence from home, no further observations were made at the Falls until July 29 and 30 on which days the waters around the same rocky islets harboured 2 Loons in full breeding plumage; 3 Horned Grebes two of which were in the dark breeding plumage while the other was in an intermediate phase; 3 American Mergansers *(Mergus m. americanus)*, one an adult male and the other two youngish appearing birds of undetermined sex; 5 Golden-eyes, one a female, others apparently male, but only one showing much black and white for the group at this time was in a transition stage of plumage; 2 Black Ducks; a Mallard female; and 2 Canvas-backs of very immature appearance. On three visits within the period August 6-8, the following waterfowl were present in the area:— Loons 2; Horned Grebe 3, only one still in breeding plumage the other two changing to autumn feathering; Golden-eye 5, the four males in an advanced state of eclipse with only one showing any appreciable extent of black and white plumage; American Mergansers 2, a male and a female. Canvas-back 2, apparently the same immature looking birds as seen on July 29 and 30, and Baldpates *(Mareca americana)* 2, both possibly immature, or in a complete eclipse type of plumage, and the latter would seem more probable for they were very brown on back and scapulars, with breasts white, and heads patchy with brownish an dwhite.

On August 15, the two Loons, two of the Horned Grebes, the five Golden-eyes, the two American Mergansers, and the two Canvas-backs were still in the vicinity of the rocky islets.

A visit on September 3, revealed the two Loons; four Horned Grebes; four Golden-

[1] Received for publication October 21, 1949.

eyes, and the pair of American Mergansers, the male in such a heavy moult that it was to all intents and purposes flightless, as was evidenced when it was seen to leave the water, and scramble up onto a rather high rock.

On September 10, there were present in the area one Loon in summer plumage; 4 Horned Grebes, three in the grey and white plumage of winter, and one darker, browner looking bird; Golden-eye 6, now seemingly revealed as four males and two females; American Mergansers 2, the male appearing very much larger than the female, and in some form of eclipse plumage and heavy moult, and the two Canvas-backs, apparently the same immature looking birds previously recorded.

On September 15, the waterfowl in this particular part of the River, were much as on the 10th, except that on this day both Loons were present.

Although not all found on every recorded visit, a circumstance not to be wondered at in view of the extent of the water surface, and the rocky, and in some places overhung nature of the shoreline, there would appear to be little reason to doubt that the broad waters of the lower Niagara River, in that area between the Falls and the Rainbow Bridge, harboured throughout the summer of 1949, two or more Common Loons; three or four Horned Grebes; six Golden-eyes, and two Canvas-backs; while during the greater part of the period, at least from the end of July on, a pair of American Mergansers were also present. The appearance and disappearance, throughout the period, of the four species of surface feeding duck mentioned, Gadwall, Mallard, Black Duck, and Baldpate does not necessarily mean that these birds were not in the general area throughout the summer, but rather indicates that they were never far away, but spent intervening periods elsewhere on the River, and most likely in the shallows above the American Falls and around Goat Island.

While admittedly two of the species mentioned in the foregoing notes, the Mallard and the Black Duck, are well enough known local breeding birds, and while not entirely ruling out the possibility of flight crippling injury to at least some of the other birds, the apparent presence throughout the entire summer, on the lower Niagara River, of such northern breeding waterfowl sustaining themselves in seemingly perfect health, and going through their normal seasonal plumage changes, represents an unprecedented observation in my long experience of water-birds on the Niagara, and would in consequence seem sufficiently unusual to be worth placing on record.

ADDITIONAL NOTES ON THE BIRDS OF RENFREW COUNTY, ONTARIO[1]

HOYES LLOYD, ROBERT G. LANNING, and SHELDON DAVIS
Ottawa, Belleville, and Eganville, Ont.

SINCE THE COMPLETION of "Observations on the Birds of Renfrew County, Ontario"[2] additional material has become available. Sheldon Davis of Eganville, who has lived in the county all his life, and who knows it well, has joined with us and has added important records. Lanning visited Combermere in 1946 from October 10 to 13, and in 1948, from October 8 to 11. From February 7 to 16, 1948, the area surrounding Eganville was carefully surveyed. Lloyd visited the Y.M.C.A. Camp, Golden Lake, during the following periods: 1946, July 3 to 13, and July 23 to August 2; 1947, June 5, June 30 to July 10, July 21 to August 1; 1948, July 5 to 13, July 21 to 30. Lloyd camped at Lake Doré in 1947 from October 3 to October 9. Lloyd and Lanning camped at Lake Doré from June 21 to 27, 1948 and travelled through much of the northern part of the county, going as far as Round Lake and Stonecliffe.

Fifteen additions are made to the list of birds observed in Renfrew County, bringing the total number of species to 189, with definite breeding evidence established for 84.

[1] Received for publication January 9, 1950.
[2] 1948. Lloyd, Hoyes, and Lanning, Robert G., Can. Field-Nat. 62:47.

1. **Gavia immer immer** (Brünnich).
COMMON LOON. A specimen examined in the flesh on June 24, 1948 was referable to this race because the bill measured 90 mm.

2. **Phalacrocorax auritus auritus** (Lesson).
DOUBLE-CRESTED CORMORANT. A young bird received by the Royal Ontario Museum of Zoology on October 5, 1946, was collected by R. Jones at Westmeath.

3. **Falco columbarius columbarius** Linnaeus.
EASTERN PIGEON HAWK. One was seen by Lanning on June 24, 1948, near Petawawa.

4. **Charadrius vociferus vociferus** Linnaeus.
KILLDEER — Although a common summer resident, the first definite breeding evidence was on July 4, 1948, when two young were found in a field east of Lake Doré.

5. **Bartramia longicauda** (Bechstein).
UPLAND PLOVER. Dr. P. Harrington states that he observed this species in June 1939, near Arnprior.

6. **Calidris canutus rufa** (Wilson).
AMERICAN KNOT. Five birds were seen on October 9, 1947 by Lloyd and Davis, on the shore of Lake Doré.

7. **Zenaidura macroura carolinensis** (Linnaeus).
EASTERN MOURNING DOVE. Davis secured a juvenile bird not long out of the nest on June 12, 1948, at Lake Doré.

8. **Bubo virginianus virginianus** (Gmelin).
GREAT HORNED OWL. A specimen in the Lloyd collection taken at Perrault on July 1, 1947, has been referred to this race.

9. **Nyctea scandiaca** (Linnaeus).
SNOWY OWL. A mounted specimen of one which had been taken locally was examined by Davis in Pembroke.

10. **Melanerpes erythrocephalus erythrocephalus** (Linnaeus).
RED-HEADED WOODPECKER. A specimen was taken by Davis on June 5, 1948, near the Davis Cottage, Lake Doré, in hardwood forest.

11. **Empidonax traillii traillii** (Audubon).
ALDER FLYCATCHER. A specimen was taken on June 24, 1948 near Rankin.

12. **Contopus virens** (Linnaeus).
EASTERN WOOD PEWEE. A nest was found 30 feet up in an elm tree at Lake Doré on July 10, 1948.

13. **Iridoprocne bicolor** (Vieillot).
TREE SWALLOW. Definite breeding evidence was established when an adult was seen feeding young in a bird-house in Pembroke on June 22, 1948.

14. **Perisoreus canadensis canadensis** (Linnaeus).
CANADA JAY. Uncommon resident, common winter resident, breeds. Noted on February 8, 1948, and on June 21, 1948, three juvenile specimens secured were being fed by parents in a jackpine forest near Round Lake.

15. **Corvus corax principalis** (Ridgway).
NORTHERN RAVEN. Seen on the opening date of the deer hunting season (first week in November) from 1939 to 1947 by Davis, west of Pembroke. A specimen taken, Sept. 5, 1948, at Lake Clear.

16. **Corvus brachyrhynchos brachyrhynchos** Brehm.
EASTERN CROW. On February 12, 1948, two crows were seen feeding on refuse near Eganville, a winter record.

17. **Anthus spinoletta rubescens** (Tunstall).
AMERICAN PIPIT. Common fall migrant. Seen several times on farmland near Lake Doré during October 1947, and at Combermere October 1948.

18. **Lanius ludovicianus migrans** Palmer.
MIGRANT SHRIKE. A juvenile specimen not long from the nest was taken near Rankin on June 22, 1948, establishing a breeding record.

19. **Acanthis flammea flammea** (Linnaeus).
COMMON REDPOLL. A small flock was found on February 12, 1948, near Eganville. Apparently they are erratic winter residents.

20. **Spinus pinus pinus** (Wilson).
NORTHERN PINE SISKIN. Flocks were noted on October 8, 1947, by Lloyd and Davis at Lake Doré, and Siskins were abundant in February 1948, throughout the area visited by Lanning.

21. **Loxia curvirostra sitkensis** (Grinnell).
SITKA CROSSBILL. On June 5, 1947, a female was secured by Lloyd from a small flock feeding in the red pines at Golden Lake. W. Earl Godfrey, ornithologist, National Museum of Canada, assigns it to this subspecies.

22. **Loxia leucoptera leucoptera** Gmelin.
WHITE-WINGED CROSSBILL. Five males in full breeding condition were taken from

several small flocks at Lake Doré in February, 1948. Presumably, because of absence of females and condition of specimens taken, they may have been nesting.

23. **Spizella arborea arborea** (Wilson). EASTERN TREE SPARROW. Small flocks winter throughout the area.

24. **Zonotrichia leucophrys leucophrys** (Forster). WHITE-CROWNED SPARROW. Migrating flocks observed October 2-20, 1948, at Rankin and Lake Doré by Davis.

25. **Melospiza georgiana georgiana** (Latham). SWAMP SPARROW. A specimen was taken on October 11, 1948, at Combermere, from a large flock congregated in Conroy's Marsh.

ADDITIONAL REFERENCE:

1947—Brown, N. R. Can. Field-Nat. 61:47. Observations on the Birds of the Petawawa Military Reserve and Surrounding District, Renfrew County, Ontario.

ANOTHER PARALLEL MUTATION IN OENOTHERA [1]

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IN going through the large collections of *Oenothera* at the Gray Herbarium I have come across certain forms of more than ordinary interest. The purpose of the present note is to describe two of them as a new species and its variety. Some students of *Oenothera* would doubtless regard the variety as another micro species, for they show many differences; but I am following the plan of attaching one form to another as a variety whenever the relationship is clear. In this case the most striking feature of the variety has clearly originated as a parallel mutation in a local area. This makes it of much taxonomic as well as genetic interest. The description of the species, according to a system adopted a decade ago, is as follows:

O. **perangusta** n. sp.

Stem ca. 50 cm. high, apparently slightly bent, diffuse red, with appressed and crispate puberulence and very scattered long hairs from small red papillae. The remains of the rosette are attached to its base. Stem leaves 10 cm. x 10-12 mm. narrow lanceolate, pointed, red at tip, midribs apparently red, upper surface nearly glabrous, lower surface with fine puberulence, denser on the midrib. Upper part of stem bears numerous red papillae, but the upper bracts are little more pubescent than the leaves. The ovaries and young fruits are densely hairy pubescent, without red papillae. Buds yellow, with few short hairs but no red papillae. Ovary 8-9 mm. long, hairy; hypanthium 30 mm., slender; bud cone 9-13 mm., sepal tips greenish, tipped with red, 1-2 mm., terminal, appressed, somewhat hairy; petals 15-20 mm. long.

The type specimen was collected on a sandy beach of Lake Huron at Stokes Bay, Bruce Peninsula, Ontario, by P. V. Krotkov in 1934, as No. 9252, University of Toronto Herbarium. Another specimen collected by P. V. Krotkov at Dunk's Bay, Bruce Peninsula, 1933, differs only in having less red stem and less hairy fruits. Another by the same collector at Queenleen Lake, 1936, agrees closely with the last. *O. perangusta* is especially characterized by its very narrow leaves, the hairy ovaries and young fruits, and the small flowers (petals *ca.* 10-20 mm.). It differs markedly from *O. strigosa* Rydb. in that the latter has soft gray pubescence on the leaves. The pubescence on the buds is also very different, the leaves are shorter and broader, the stems not red and the flowers frequently smaller. The persistent rosette of *O. perangusta* is another distinguishing feature. Its distribution is generally more northern, and specimens from near Edmonton, Alta., 1941; Milk River, Assiniboia, coll. by John Macoun in 1895 as No. 10644, Herb. Geol. Survey Canada; Leeds, North Dakota; and Idaho 1941 (5,500 ft.) belong here rather than to *O. strigosa.* These all have reddish *(rubrinervis)* buds, but green hypanthia. *O. strigosa* is typical in Nebraska, Wyoming, Colorado, where the hypanthium may be densely pubescent and the petals only 12 mm.

[1] Received for publication February 22, 1950.

Diagnosis: Caulis brevis, ad extremum rubro-tuberculatus, et in speciem leviter curvus. Folia caulina angustissime lanceolata, plana, costa in speciem rubra. Sepala et hypanthium virides. Alabastra lutea, ovaria et capsula immatura dense hirsuta, hypanthium tenue; apices sepalorum virides, rubrotincti, 1 mm. longi, appressi, sepala aliquantum pilosa; petala circa 20 mm. longa. Bractae non hirsutae.

To this species is also attached a specimen from a gravelly bank along a stream, at Marie Louise Creek, Sibley Township, Thunder Bay District, Ontario, in Lat. 48° 20'N. Long. 88° 50'W., collected for the Nat. Herb. Canada as No. 830 by Taylor, Losee and Bannan in 1936. It differs from the type in (1) somewhat broader leaves (10 cm. x 14 mm.), (2) the ovary and fruits are not hairy, (3) petals only 10-11 mm., fading pink.

O. perangusta thus extends from the Bruce Peninsula of Lake Huron along the north shore of Lake Superior, westwards to Edmonton, Alberta, and southwards into Montana.

Another sheet, from the Thunder Bay District on the north shore of Lake Superior, resembles the species in certain features and the variety to be described in certain others. It was also collected by Messrs. Taylor, Losee and Bannan in 1936, as No. 831, at Sleeping Giant, Ontario, for the National Herbarium of Canada. The sheet bears two small plants (height only 20-25 cm.) which have no mature flowers but very young buds. The stems show little diffuse red but the leaves are even narrower (midleaf 6.5-7.5 cm. x 7-9 mm.). Other features of these two plants, which come from the same area as the "variety" to be described, will be referred to later.

O. perangusta var. **rubricalyx** n. var.

Unlike most Oenotheras, the rosette is persistent[2] after a stem is formed. The stem is short (30-35 cm.) but stout and has abundant red papillae. It is also intensely red from diffuse pigmentation, especially in the upper part (*ca.* 5 cm.) which is also strongly bent in both specimens. The rosette leaves are *ca.* 12 cm. x 11-12 mm., oblanceolate, tapering to long, ± margined petioles; stem leaves very narrow, a midleaf measuring *ca.* 9 cm. x 9 mm., narrow-lanceolate, subentire, acuminate, tipped with red, both surfaces having a fine puberulence, midrib evidently red. Upper bracts hirsute on both surfaces, the very long, white hairs not arising from a papilla. The bracts also show much diffuse red on their lower surface. Inflorescence relatively dense, ovary 11-13 mm. in length, hypanthium 30 mm., bud cone 18 mm.; sepal tips 4 mm., green, hairy, terminal, appressed, tipped with red. Petals 15-19 mm. long, filaments 8 mm., anthers 9 mm.; stigma lobes *ca.* 6 mm. base of lobes *ca.* 5 mm. above hypanthium, so the flower is self-pollinated before anthesis. The ovaries and young fruits bear a dense hirsute pubescence arising from red papillae, as well as fine puberulence, the sepals and hypanthium having scattered long hairs from mostly white papillae.

The pigmentation of the sepals is deep red, corresponding with the extreme condition (No. 5) found in *rubrinervis* (Gates 1911), the anthocyanin extending practically to the margins but the midvein remaining green. In the *rubricalyx* mutation, to which this is a parallel, the midvein is darker red than the rest of the sepal. The variety here described agrees, however, with the *rubricalyx* mutation in having the unique feature of a deep red hypanthium.

Diagnosis: Folia radicalia anguste oblanceolata, persistens. Caulis brevis, apice declinato, praecipue ad extremum rubro-tuberculatus etiam rubro-tinctus. Inflorescentia comparate condensa. Folia caulina angustissime lanceolata, plana, costa rubra. Sepala et hypanthium valde rubra, hypanthium crassum; apices sepalorum virides, 4 mm. longi, appressi, pilosi; petala 15-19 mm. longa, bractae et ovaria hirsuta, bractae infra rubrae.

This striking form is represented by a single sheet in the Gray Herbarium, containing two specimens which were collected by A. S. Pease and R. C. Bean in 1933 by the Canadian Pacific Railway track at Jackfish Station in the Thunder Bay District on the north shore of Lake Superior, Ontario. As representing a variety of *O. perangusta*, it differs from the species in (1) *rubricalyx* pigmentation of sepals and hypanthium, (2) bracts and fruits much more hairy, (3) hypanthium stout not slender, (4) stem tip strongly bent, (5) stem tip very red, (6) upper bracts hairy and red on their lower surface, (7) rosette persistent.

[2] The fact that in the species the remains of the rosette were still attached helps further to connect these two forms.

The sheet from Sleeping Giant, in the same general area, contains, as already mentioned, two small, rather depauperate plants with extremely narrow leaves. The bracts and young fruits are hairy, as in the variety, but the bracts are not red below. From the general lack of pigmentation, the indications are clear that this form would have green, not red, hypanthia. These depauperate specimens therefore probably represent the green-budded species from which the variety must have been derived.

Two other sheets in the Gray Herbarium apparently represent independent developments of deep red buds and hypanthium, and are therefore included in var. *rubricalyx*. One of these was collected near Pony, Montana (alt. 7000 ft.) as No. 4584 by P. A. Rydberg and E. A. Bessey under the name of *O. strigosa*. The stem is diffuse red and has red papillae, midleaf 8 cm. x 11-12 mm., hypanthium and bud cone red, but paler than the type; petals 15 mm., ovary and fruits less hairy. The other sheet was collected at Suksdorf Gulch, Montana, 1916. It has a red hypanthium, and many red papillae on the sepals and fruits as well as the stem. It differs from the type in having (1) fruits and bracts less hirsute, (2) shorter stem leaves, 5.5-6 cm. x 11 mm. Other plants from Montana have green buds. Occasional sheets are seen in which the hypanthia have become pale reddish in drying, and the same frequently occurs to the petals of Western species, but this is another matter.

The genetic significance of this find will emerge more clearly from a brief account of the origin of the *rubricalyx* mutation from *O. rubrinervis*. Over forty years ago a single plant with red sepals and hypanthium appeared in a culture of *Oenothera rubrinervis* from the sand dunes on the Lancashire coast of England, north of Liverpool (see Gates, 1914), where introduced Oenotheras had flourished for over a century. Among my cultures from this source at the University of Chicago in 1907 (the seeds having reached me through Dr. D. T. MacDougal) were several of the mutant *rubrinervis* from *O. Lamarckiana*. In one of these *rubrinervis* cultures a single plant appeared having deep red sepals and hypanthium. This was called *O. rubricalyx*. Many pure seeds were obtained by self-pollinating the flowers, but through an accident only four plants survived and were grown at Woods Hole, Massachusetts, in 1908. These were all *rubricalyx*. Selfed seeds of two of these plants produced at the Missouri Botanical Garden in 1909 *rubricalyx* and *rubrinervis* in the ratios respectively of 14:6 and 33:11. More seeds sown in 1910 produced 70 plants, but only 15 of them came into bloom, 10 with red buds; 5 with green buds.

These three ratios give a total of 57:22, thus providing clear evidence that the *rubricalyx* mutation was a simple Mendelian dominant. This and other evidence of pigment variation was described in detail, with a colored plate (Gates 1911). Much subsequent evidence of Shull (1926), Catcheside (1940) and others has confirmed the status of mut. *rubricalyx*, but it has never appeared in cultures again and is thus perhaps the rarest of the mutations. The characteristic feature of intensely red buds is hitherto unknown in any wild Oenothera, although certain forms from Nantucket and the Magdalen Islands with a pale pink hypanthium approach it. The *rubricalyx* character has no known advantage in relation to natural selection, and as the plants here described were growing in a ruderal condition along the railway lines it may have been exterminated, but no doubt specimens from the same collection were distributed to other herbaria.

The origin of this red-budded variety in one locality fits precisely my conception of how new characters in any genus arise and spread. I know of no other case in which a mutation has first arisen in cultures of one species and afterwards been found wild in a different species of the same genus. One would like to know whether all the plants in this Thunder Bay locality had the deep red buds or whether some had *rubrinervis* buds with a green hypanthium. This question receives a partial answer from the two plants in collection No. 831 at Sleeping Giant, which showed no evidence of the *rubricalyx* pigmentation.

It is hoped that visitors to the Jackfish locality will observe the present state of the Oenothera population, to determine whether this character is spreading or is being exterminated, and whether the usual

green-budded type also occurs intermingled in the population. If both occur, it would be of much interest to determine the relative numbers and how they change from year to year.

Gates, R. R. 1911. Studies on the variability and heritability of pigmentation in Oenothera. *Zeits. f. Abst. u. Vererb.* 4: 337-372.

———. 1914. Some Oenotheras from Cheshire and Lancashire. *Ann. Mo. Gard.* 1: 383-396. Pls. 3.

Shull, G. H. 1926. "Old-gold" flower color, the second case of independent inheritance in Oenothera. *Genetics* 11: 201-234.

Catcheside, D. G. 1940. Structural analysis of Oenothera complexes. *Proc. Roy. Soc.* 128B: 509-535.

ADDITIONS TO THE BIRDS OF SIMCOE COUNTY, ONTARIO [1]

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SINCE THE ACCOUNT of the Birds of Simcoe County, Ontario, was published (Trans. Royal Canadian Institute, Vol. XXIV, part 2, 1943 and Vol. XXV, part 1, 1944), considerable valuable information has come to the writer's attention. It was thought advisable to place it on record at this time and bring the list of birds up to date.

To the original list of 257 species, ten new birds have been added, making the present total 267. The number of breeding species has been increased by two with the addition of the Wilson's Phalarope and the Philadelphia Vireo, the total now standing at 138 species which have been known to nest and rear their young in the county. Other birds of which increased distributional data have been gained are also included.

I am indebted to the many correspondents who have contributed information pertaining to Simcoe birds. Particularly valuable have been the records of the late Dr. E. L. Brereton, Dr. J. Murray Speirs and Messrs. R. D. Ussher and A. J. Mitchener.

WESTERN GREBE.

Aechmophorus occidentalis. — An individual of this species was observed on October 25, 1944, at the head of Kempenfelt Bay, Lake Simcoe, by Dr. E. L. Brereton, and a note to this effect appeared in the Canadian Field-Naturalist (Vol. 59, p. 68, 1945). The grebe was studied for an hour at various distances up to within 30 yards of the shore and pertinent details as to plumage and behaviour noted. This is the only record for the county.

GREAT WHITE EGRET.

Casmerodius albus. — Two additional observations of this southern visitor are now available. One was seen on Batteaux Creek, near Batteaux Station, on July 27, 1946, by Dr. E. L. Brereton; and another was noted at New Lowell during the week of August 11, 1946 by Mr. Lawrence Davis.

The writer is now able to report that the fine specimen of Great White Egret collected by the late Mr. W. Sutherland at Orillia, April 30, 1908, and previously recorded, has been donated by his son, Gordon, to the Royal Ontario Museum of Zoology for permanent preservation.

COMMON GLOSSY IBIS.

Plegadis falcinellus. — The writer is indebted to Mr. J. L. Baillie of the Royal Ontario Museum of Zoology for calling his attention to a Simcoe County occurrence of this unusual species as recorded in one of Charles Fothergill's manuscripts ("Memoirs and Illustrations of Natural History", in the Royal Ontario Museum of Zoology) of 100 and more years ago. Fothergill's detailed description leaves no doubt as to the identity of the birds concerned. He states: "They were shot in what are called the Narrows of Lake Simcoe, near where the river runs out of and leaves that lake towards Lake Huron. An Indian returning homewards to his camp in the evening during the fall of 1828, late in October or early November, observed a pair of strange-

[1] Received for publication March 6, 1950

looking birds, of which he was ignorant, alight upon an old log upon the shore, near the edge of the water, apparently much fatigued. He fired and killed both at one shot. I regretted much they were skinned and stuffed with feathers when they came into my hands through the kindness and attention of Mr. Charles Heward of York." According to Fothergill's very detailed description: ". . . the length of one of the birds from tip of bill to end of tail 2 feet 2½ inches, of the other, 2 feet 3½, but this difference might have been occasioned by the stuffing or drying . . . . bill to the corners of the mouth in one specimen was 5½ inches in the other 5¾ inches, following the curve of the upper mandible. Both mandibles much curved and the upper one grooved and polished the entire length, the bill very thick and strong at the base and somewhat swelled out at the tip, of a dark olivaceous brown or deep horn colour approaching to an entire black. Head, neck and all the under parts of a deep and rich chocolate brown or mulberry colour, brightest on the breast and a good deal glossed on the shoulders and upper part of the back, etc. . . ."

WHISTLING SWAN.

Cygnus columbianus. — Additional records for the Whistling Swan in the county were established during 1948. On March 28, 1948, Dr. E. L. Brereton saw 10 swans flying northwestward over Barrie. Mr. A. J. Mitchener noted 5 swans on Nottawasaga Bay, near Craigleith on November 11, 1948; and 14 were counted in Collingwood Harbour by Dr. Brereton on December 5, 1948. An interesting summer record concerns a Whistling Swan which was found alive on July 31, 1949 in a ditch near Alliston by Game Overseer Ellis. The swan, which appeared to have an injured wing, was brought to Barrie but lived only a few days.

KING EIDER.

Somateria spectabilis. — On December 15, 1948, Dr. E. L. Brereton saw a King Eider off Big Bay Point, Innisfil Township, Lake Simcoe. This constitutes the second record for the county, a specimen (in the Royal Ontario Museum of Zoology) having been taken on November 1, 1926.

GYRFALCON.

Falco rusticolus. — Dr. E. L. Brereton observed a White Gyrfalcon near Barrie on October 26, 1948. A letter received from him at that time states, in part: "Mrs. Brereton and I drove out the Shanty Bay road about 9:30 A.M. Passing through the heavily wooded part east of Raikes, I suddenly noticed through a break in the trees a large bird that I at once thought to be a Snowy Owl. It was sitting ten feet from the ground on the lower branch of an old dead tree which stood out alone about 200 yards from us in an open pasture field . . . stepping out of the car I discovered that the supposed owl was in reality a hawk — yes, beyond any doubt it had a hawk's head. The head, throat, breast and upper part of the body were pure white. The lower part of the body down to the branch was white but a little dingy. Several inches of tail showing below the branch were pure white. There was a little dusky smudge around the eyes and as it turned its head two or three times and its body once to the right I could see dark markings on the back of the neck, back and lower edge of the wings (primaries) . . . As I stood watching it (after nearly 10 minutes) it suddenly shot out from the tree and with outstretched wings glided swiftly to the ground 75 yards away where a flock of starlings exploded into the air . . . as the hawk also shot straight up into the air I had a brief but clear view of the wings. They were those of a falcon."

KING RAIL.

Rallus elegans. — Mr. A. D. Henderson of Belvedere, Alberta, and formerly of Barrie, in a letter to the writer dated December 29, 1944, states: "On November 9, 1896, I killed a large rail on the Nottawasaga River, I think it was a King Rail. I believe this record perfectly good as I had McIlwraith's Birds of Ontario and Coues Key to refer to at that time." This is an additional species for the county.

STILT SANDPIPER.

Micropalama himantopus. — On August 25, 1945, Dr. E. L. Brereton identified a Stilt Sandpiper as it fed in shallow water, within 20 feet of him, at Courtice's pond on the northern outskirts of Barrie. This is the first record for the county.

BUFF-BREASTED SANDPIPER.

Tryngites subruficollis. — A single individual was under observation for over three hours on the shore at Wasaga Beach by Dr. E. L.

Brereton on August 28, 1949. This is the initial record of this species for the county.

WILSON'S PHALAROPE.

Steganopus tricolor. — The status of this species has changed from a rare spring and fall visitant to that of a rare summer breeding bird. On two occasions within recent years Wilson's Phalarope has been found breeding in the county. On June 16, 1946, a party of naturalists consisting of Messrs. David West, W. W. Smith, F. H. Emery and R. V. Lindsay discovered a pair of these birds breeding in the Holland River Marsh north of Bradford railroad station. Actions of the adults led to the finding of two young, three or four days old, running about in the marsh. One of the young was collected and is now in the Royal Ontario Museum of Zoology.

On July 20, 1947, the writer encountered a pair of these birds at Marl Lake, Flos Township. Their actions indicated that they were probably nesting but it was not until August 3, that evidence in the form of a young bird, barely able to fly, was discovered in the sedgy margin of the lake. These two records appear to be the most easterly nestings of this species for Ontario.

GREAT BLACK-BACKED GULL.

Larus marinus. — On November 25, 1944, Dr. R. M. Saunders observed two Great Black-backed Gulls at Cook's Bay, Lake Simcoe. This was the first reported occurrence of this species in the county. Another was seen at Barrie on January 3, 1949, by Dr. E. L. Brereton and a third was noted at Wasaga Beach on April 17, 1949 by Dr. Paul Harrington.

RING-BILLED GULL.

Larus delawarensis. — To the returns from Florida, Cuba and Jamaica for gulls banded in Simcoe County, already reported, the following outstanding recovery can be added — A young Ring-billed Gull banded by Mr. H. H. Southam in June, 1945, at Gull Island, near Penetanguishene (Band No. 41-669469), was found dead on November 5, 1945 at Horta, Fayal, Azores Islands, by Senor Jose Larango.

FRANKLIN'S GULL.

Larus pipixcan. — A second record for this western gull was made on October 26, 1948, when Mr. James Westman noted an immature flying over Kempenfelt Bay, Barrie. The writer in company with Dr. E. L. Brereton watched this bird for an hour on November 7, as it dived for minnows along with many Bonaparte's Gulls near Barrie railroad station. This individual was present until November 20, according to Dr. Brereton.

THICK-BILLED MURRE.

Uria lomvia. — Additional occurrences for this unusual species were reported on December 8, 1948, when Mrs. James Westman saw a single individual on Kempenfelt Bay, off Lover's Creek, and called it to the attention of Dr. E. L. Brereton, who confirmed the identification; and December 15, of the same year, when Dr. Brereton saw eight of them off Big Bay Point, Lake Simcoe.

HAWK OWL.

Surnia ulula. — A mounted specimen, which had been shot by Mr. Lawrence Davis at New Lowell on November 3, 1933, has been examined by the writer. This is the second record for the county.

CAROLINA WREN.

Thryothorus ludovicianus. — In a recent conversation, Mr. Norman Martin assured the writer that he had observed this large wren at close range and heard it singing on June 30, 1939, at his Lake Simcoe summer home at Sandy Cove, Innisfil Township. This is the only record of its occurrence in the county.

PHILADELPHIA VIREO.

Vireo philadelphicus. — The first breeding of this species in the county was established on July 25, 1948, when Mr. A. A. Outram saw a young bird, out of the nest, being fed by a parent on an island in the Severn River, two miles northeast of Washago. The island is located on Lot 11, Concession 18, Orillia Township. This appears to be the most southerly nesting record of the Philadelphia Vireo for Ontario.

CAPE MAY WARBLER.

Dendroica tigrina. — A male observed on Beckwith Island in July, 1948, by Dr. J. Murray Speirs marked the most southerly summer occurrence for Ontario.

RED CROSSBILL.

Loxia curvirostra. — Present on Beckwith Island from May 25 to July 11, 1948, according to Dr. J. M. Speirs, constituting the second summer occurrence for Simcoe County.

HENSLOW'S SPARROW.

Passerherbulus henslowii. — A new summer location for this rare sparrow was discovered by Dr. J. Murray Speirs on July 7, 1945, when he noted several singing males in a grassy field, 3 miles west of Barrie on the Camp Borden road. The birds were still present on July 27.

SHARP-TAILED SPARROW.

Ammospiza caudacuta. — This interesting sparrow was added to the county list when one was identified under excellent light condition by Dr. E. L. Brereton on September 19, 1945, in the northern environs of Barrie.

CLAY-COLOURED SPARROW.

Spizella pallida. — Here is another species whose status in the county appears to have changed since 1942. Formerly recorded only as a rare migrant, we now find it summering in at least four localities. On June 28, 1945, Mr. R. D. Ussher saw two singing Clay-coloured Sparrows in a mixed plantation of small red, scotch and jack pines at Elsie Mills County Forest, Concession 6, Medonte Township. Dr. J. Murray Speirs found at least two singing birds, which seemed definitely established in a pine plantation, on the southwestern outskirts of Penetanguishene on May 30, 1948.

Other occurrences noted by Mr. R. D. Ussher which may indicate possible breeding areas are two birds at Midhurst Re-forest Station on June 7, 1946, and another along the northern boundary of Camp Borden, near Angus on June 10, 1949.

HARRIS'S SPARROW.

Zonotrichia querula. — In addition to the two sight observations of Harris's Sparrow previously reported, there can be added the following:—On October 18, 1947, the writer and his wife noticed one of these large western sparrows in a mixed flock of White-throated and White-crowned Sparrows moving southwestward along the ridge at Three Mile Point, near Wasaga Beach. This bird, which was eventually collected, proved to be an immature female and apparently the first specimen for the county.

SMITH'S LONGSPUR.

Calcarius pictus. — This longspur is included on the basis of two sight records. Although no specimens are as yet available, it is believed that the birds concerned in the following observations were of this species. The first was detected by Dr. E. L. Brereton in a flock of feeding Lapland Longspurs in a ploughed field near Barrie on November 2, 1947. Another was identified by the writer and his wife on May 22, 1949, near Elmvale, Flos Township. Further work may establish Smith's Longspur as a rare, but regular, migrant through the county.

DIRECTIONS FOR USING A PLASTIC ADHESIVE IN MOUNTING PRESSED BOTANICAL SPECIMENS[1]

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THE PURPOSE of this paper is to introduce the use of plastic adhesives in place of glues in the process of mounting pressed plant specimens. In an effort to devise a method of mounting plant specimens which would require a minimum of time and give maximum strength and durability, the Wildlife Food Habits Research Laboratory sponsored by the Ontario Research Council at the Royal Ontario Museum of Zoology, experimented with Polyvinyl Acetate. This material produced the desired results.

In addition to the experiments with Polyvinyl Acetate, laboratory reports were consulted from the Shawinigan Falls Chemicals Limited, Quebec, and from the Carbide and Carbon Chemicals Corporation, New York. These gave proof of even higher qualities and greater permanence than were first anticipated.

Polyvinyl Acetate is recognized in Canada under the trade name of "Gelva". It con-

[1] Received for publication April 3, 1950.

[2] Future work of the author will be carried on with the Department of Lands and Forests, Maple, Ontario.

sists of colourless, granular crystals and is graded by its degree of polymerization or molecular weight. The viscosity in solution is the distinguishing point between the various grades. The grades now being manufactured range from V.1.5 to V.60. A medium to high viscosity is recommended for porous materials, and it was found that the grade V.25 gave excellent results. Gelva has many solvents, but methyl or 95% ethyl alcohol has proved to be best suited for our purpose. The solution is obtained by adding one part by measure of Gelva crystals to two parts of ethyl alcohol. The mixture is then heated in a double-boiler until all the crystals are dissolved. A low flame should be used and other necessary precautions taken. Alcohol being quite volatile, it is often necessary to add small quantities to a mixed solution of gelva when open and in use.

The following implements are required for mounting under this method (as with the usual "glue" method):

1 sheet of glass (slightly larger than the common herbarium paper).

1 jar of Gelva and 1 of solvent

2 pairs of forceps (1 kept free of solution to arrange specimens)

1 ordinary plant press and weight (10 to 12 lbs.)

A piece of gauze, an applicator (brush), two or three small blotters, herbarium paper and newsprint.

Procedure:

(i) Arrange the specimen to be mounted in the desired position on a sheet of herbarium paper and make a mental note of the composition.

(ii) Spread a thin layer of Gelva over the glass, using any of the conventional methods (brush, swab, roll-coat, etc.).

(iii) Place the specimen in the layer of Gelva on the glass and make sure all the under surface is coated.

(iv) Lift the specimen carefully by the stalk or stem and allow the tension to draw the leaves and branches from the solution.

(v) Place the apex of the specimen in the desired position on the paper, then arrange the leaves and branches as it is lowered.

(vi) Swab off any surplus solution with gauze dampened in the solvent.

(vii) Place the specimen in the press between sheets of newsprint and apply the weight.

In the interim of finishing the mount, the solution on the glass may become tacky. In this case an application of the solvent or an additional layer of Gelva should be applied before continuing. If the layer on the glass begins to set or becomes too unwieldy, it can be rolled off under warm water. Then the glass should be dried and a fresh layer of Gelva added. Do not discard the ball of Gelva removed from the glass as it will dissolve overnight in the Gelva stock in the jar. If the newsprint in the press should stick to the mount, merely apply the solvent over the spot on the newsprint and it will soak through sufficiently to release it.

Labels may be fastened to the mount before placing it in the press. Touch the corners of the label to the solution on the glass and apply it to the lower right hand corner of the mount. When the press is filled (ordinarily 20 or 30 specimens) the first specimens may be removed, placed in their genus covers and incorporated into the collection. By the time the day's mounting is completed and materials and equipment cleaned and stored, the remainder of the plants may then be taken from the press and placed in the herbarium.

Several hundred plants in the herbarium of the Wildlife Food Habits Laboratory have been mounted with Gelva. Use of these specimens shows no loose ends of leaves, petals, stems or branches with the usual resulting damage through handling. Gummed strips formerly used for specimen mounts have been eliminated entirely. A collection of plants gathered in the latter part of the 19th century has been remounted, following the method described above, with amazing results. The undersurfaces of these old desiccated specimens, impregnated with Gelva in the process of mounting, were strengthened to such an extent that the plants will either support the mounting paper if picked up at one end or will bend with no injury to the specimen whatever.

In conclusion the following points are worthy of note:

a) The mounts are extremely durable due to the fact that Gelva reinforces the plants with a backing of plastic that is unaffected by age and does not become brittle after drying. Gelva has very high penetrative qualities which are especially valuable for adhering water-

proof stems and culms of grasses. The specimens will not become detached but can be removed with the solvent if necessary. Tapes are eliminated entirely.

b) The mounts are clean as Gelva is colourless and the surplus is readily dissolved with alcohol without discolouration of the sheet. Blue and purple anthocyanin pigments in petals and other plant parts are not affected since Gelva does not contain acid.

c) Gelva can be spread easily over the glass, flows rapidly over the contacting surfaces and dries by the evaporation of the alcohol.

d) The use of Gelva has proved to be an economical method of mounting pressed plant specimens. Only a very small quantity is required to do a number of plants and the Gelva film left on the glass is reclaimable. Also the time required in processing is less than that required in older methods.

FRANCIS J. A. MORRIS (1869 - 1949)

EDMUND M. WALKER
Royal Ontario Museum of Zoology, Toronto.

IN THE DEATH of Francis J. A. Morris, Canada has lost a great teacher of English literature, a classical scholar, a writer of charm in both prose and verse, and a naturalist of distinction. After a lingering illness of some years' duration, he died on December 31, 1949.

Until he was 25 years old, Frank Morris lived in the British Isles. He was born in 1869 in a parsonage near the Scottish town of Crieff, in Perthshire, where he remained until the death of his father, when Frank was thirteen years old. It was during these boyhood years in Scotland that he laid the foundation of his later interests. He was fascinated by all the living things about him. Flowers were his first interest, then, with the companionship of his brother, he became engrossed in birds and birds' nesting, in the rearing of moths and butterflies, and finally in insects generally, which, for a few years, the brothers collected assiduously.

After the death of their father, the boys were moved to London, where they suffered a partial separation by attending different schools, but still carried on their hobbies together. Frank attended Dulwich College, where he became immersed in the Classics and English literature, reading widely, particularly nineteenth century poetry and the novels of the day. The brothers continued to spend their free time together, adding to their collection of insects and, under the guidance of a new school friend, making long excursions into the countryside. This friend's favourite hobby was fossil collecting and to this new pastime he introduced the Morris brothers, taking them out to the chalk pits near Croydon, where they spent many hours digging out fossils from the chalk beds and delighting in the many new kinds of birds and insects of the downs.

The brothers still spent their holidays together in their old haunts in Scotland but, when Frank was sixteen, his brother set sail for Australia and Frank was thrown on his own resources. School studies claimed most of his time and the boyish interest in collecting waned, although his delight in the contemplation of living nature grew even more intense.

Morris's outlook on nature, however, soon began to be coloured by a rapidly growing interest in Darwinism and the theory of Evolution, which he had often heard discussed at school, although it was during a holiday trip in Scotland that his interest in the subject was truly aroused. An old army doctor, who had often been the boys' host, was a great reader and a keen disciple of Darwin and it was his exposition of the subject that actually kindled Morris's imagination.

At Oxford University, Morris continued to pursue the Classics and English literature but varied his reading with many works on Evolution. In spite of this new interest, however, his emotional attitude toward nature not only persisted but was kindled afresh by his discovery that in Wordsworth's poetry was the expression of all his own feelings and sentiments concerning nature.

Francis J. A. MORRIS (1869-1949)

Soon after graduating from Oxford, Morris came out to Canada, spending his first winter in Toronto in attendance at the Normal School. It was in Toronto that he first met Dr. William Brodie, to whom he owed his introduction to Canadian natural history. Dr. Brodie remained a close friend of Morris until his death in 1909, which was commemorated by Morris in his poem "The Master Mind".

After a summer in Toronto, Morris was appointed to the staff of the High School at Smiths Falls and here he learned from the science master how to identify plants with a "key", for he had never employed scientific methods before, as there were plenty of popular guides to the British flowers and birds. This new skill became a veritable obsession to him. He was never tired of adding to his acquaintance with the local flora so that, by the end of the second year, when he left Smiths Falls, he knew most of the commoner flowering plants of the district.

At this time he accepted a private tutorship in the neighbouring town of Perth, and it happened that his pupil was an ardent ornithologist. A close friendship grew up between tutor and pupil of the give-and-take kind, and the teacher learned much from the pupil about Ontario birds and their songs and calls.

In 1899 Morris returned to Toronto for the spring and summer. He again had the companionship of Dr. Brodie and enjoyed the opportunity of adding to his knowledge of the Ontario flora. In the following April he had settled in Port Hope where he had been appointed classical master in Trinity College School. His first two seasons here were spent in active pursuit of botany and ornithology. For a time his attention was mainly concentrated on bird watching, but he also gave much of his free time to those pupils who were interested in natural history, particularly in competing for a prize that was offered annually for the best collection of "flowers, foliage and ferns". These boys organized a Field Club with Morris as their Honorary President.

One April morning a deputation from the club came to ask Morris if insects could be accepted as a subject for the prize competition. After some consideration Morris agreed to this, but limited the field to Moths and Butterflies or Beetles. Beetles having been chosen by some of the boys, the difficulty of naming them at once became a major problem, and thus Morris was besieged with enquiries morning, noon and night. Beetles had as yet no place in Morris's hobbies and there was no "Beetle Book", like Holland's *Butterfly Book* and *Moth Book*. Thus, out of sheer desperation, Morris began to make a collection of beetles for himself and, with the help of various texts, he was soon a beetle addict in an advanced stage. This interest in beetles, particularly the "long-horns", became a permanent one and is reflected in a number of delightful essays that appeared during the years from 1913 to 1920 in the *Canadian Entomologist* and the Annual Reports of the Entomological Society of Ontario. He served as President of this Society from 1921 to 1923.

Morris had long desired to teach in the Provincial Schools rather than the private schools but, in order to qualify as a "Specialist" in Classics, as required by the Department of Education, he left Port Hope in 1911 for a year at the University of Toronto. In the following year he obtained the degree of Master of Arts as well as the Specialist's Certificate in Classics, and in September, 1913, he was appointed to the staff of the Peterborough Collegiate Institute. Here he taught Classics for a time, but his colleagues, recognizing his flair for literature, urged him to teach English. This he was finally persuaded to do but, in order to qualify as a "Specialist" in English, he must also become a specialist in History. Accordingly, although it was a heavy burden, he went once more to Toronto and, in another year, he obtained the necessary certificate which enabled him to head the English Department in the Peterborough Collegiate Institute, a position which he retained until his retirement in 1936.

It was not long after Morris was settled in Peterborough that he chanced to meet Edward A. Eames of Buffalo, whose hobby was the photographing of wild orchids. These were also favourites of Morris, and it was not long before the two enthusiasts had planned to collaborate in a book for the amateur naturalist, on *Our Wild Orchids*, the text to be written by Morris and the illustrations furnished by Eames. A most beautiful book was the outcome, a literary gem, in which the incidents recorded about each species are set forth in fine prose with those touches of gentle humour that are part of the charm of all Morris's writings. Many happy years were spent by the "foursome", consisting of the two authors and their wives, in gathering material for this venture. Even after the book was published, Morris continued to find his greatest delight in the tracking down and recording of rare and little-known orchids.

In addition to his writings on Natural History, which included also the widely circulated booklet, *Our Wild Flowers, a plea for their protection*, Morris contributed articles to *The Canadian Forum* and various other magazines in Canada and the United States. Most of his verse is unpublished but two poems "The First Hepatica" and "Life" are included in Professor Alexander's *Shorter Poems* (1924) which has been used for a whole generation in the Ontario High Schools. His love for the Victorian poets, especially Wordsworth, is clearly revealed in his own verse.

Any account of Frank Morris's life, however brief, would be inadequate without paying a high tribute to his wife (née Elma Walker) whom he married while he was living in Port Hope. Even before the long years of his last illness, she ministered faithfully and cheerfully to his needs, for he was, as related by himself, somewhat awkward with his hands, his fingers being "all thumbs". The writer recalls a week spent with the Morrises at Silver Islet, Lake Superior, when he observed with admiration how Mrs. Morris would drive the car to any spot that her husband wished to explore and would cheerfully wait for hours, if need be, until his return. It was most fortunate for him that he had such a wife to care for him during the years of his decline. To this gracious lady we extend our deepest sympathy.

NOTES AND OBSERVATIONS

An Abnormally Colored Woodcock (*Philohela minor*). — Mr. R. W. Tufts of Wolfville, Nova Scotia, has sent me in the flesh a woodcock, *Philohela minor* (Gmelin), which he characterized as a "Golden Woodcock." He writes me that in his long field experience in the Maritime Provinces of Canada he has handled thousands of woodcocks and recalls that about 1909 at Black River, Kings County, Nova Scotia, he shot one of these especially brightly colored birds and then dubbed it a "Golden Woodcock." Twenty-six years later, on October 9, 1935, he was hunting at South Berwick, Nova Scotia, and shot another brilliant, coppery-looking bird. In the first week of November, 1949, Mr. James Donly of Mill Village, Queens County, Nova Scotia, told Mr. Tufts that he had shot a peculiar looking woodcock, so different from the usual run of birds that he had placed it in his deep freeze until Mr. Tufts could see it. Tufts found it to be another "Golden Woodcock." Thanks to the interest and cooperation of Mr. Tufts I now have this bird before me.

Pettingill (1936, The American Woodcock, Mem. Boston Nat. Hist. Soc., 9, p. 197) in his monograph of this species under "Abnormal Plumage Coloration" listed only a number of cases of partial albinism. The present specimen falls in a somewhat different class, and while perhaps not as as different from the normal bird as the term "Golden Woodcock" might imply, still falls completely outside the range of variation of the 64 specimens of woodcock in the Chicago Natural History Museum in the considerably more bright reddish and less blackish and greyish color of the upperparts and merits a brief description.

The specimen, taken in the autumn of 1949 presumably in Queens County, Nova Scotia, is in fresh autumn plumage, and was fat. It proved impossible to sex it; its size is: wing 139, exposed culmen about 72 mm. Compared with other autumn birds, the under parts are richly colored but fall within the range of variation of normal birds. On the upper side the primaries are much paler, silvery grey rather than blackish; the inner secondaries and wing coverts have the blackish markings paler, more silvery grey, and the rufous markings coarser, brighter rufous, and hence this plumage is more conspicuously reddish. On the back the black blotches are still black, but seem reduced in size, and the finer dark markings are paler, more silvery grey; the brown markings are coarser and brighter red; and in some of the grey areas there is more of a rufous tinge. The result is to give the upper parts a considerably more reddish brown, sparsely blotched with black appearance, rather than a black, grey and brownish-barred appearance.

The lack of pronounced individual variation in the Chicago Natural History Museum series is rather striking. That unusually reddish birds do occur is demonstrated by the present specimen. The scarcity of such variants is indicated by Mr. Tufts' observation that he has seen but three of these birds in over forty years of active bird study and woodcock shooting. — A. L. RAND, Chicago Natural History Museum.

June Record of a European Widgeon in Manitoba.—The annual Waterfowl Breeding Ground Survey in Manitoba brought to light an interesting record of a European Widgeon (*Mareca penelope*) from the southwest part of the province. The bird, an adult male, was observed June 3, 1949, 6 miles southeast of Hartney, a region of numerous willow-rimmed potholes. While making a routine survey of the area I noted a rather grayish widgeon feeding on this typical slough. Visibility was excellent and the vegetation gave sufficient cover for me to observe the undisturbed bird for 10 minutes with a pair of 7 x 50 Bausch & Lomb glasses. The bird slowly fed its way towards me and soon approached a male American Baldpate (*Mareca americana*) which had been sleeping on a muskrat house some 10 yards away. When the two birds were both in my field of vision it was apparent that the grayish widgeon had a reddish head, a buffy crown, lacked a green eye patch and checked with all field marks for the species as given in Peterson's *A Field Guide to the Birds*. The bird appeared to be healthy and when attacked by the territorial Baldpate flew off quite readily. There was no evidence that this was a breeding bird.

The vegetation in the slough was typical of the region and consisted of a mixture of sago pondweed (*Potamogeton pectinatus*),

sparganium, *Carex*, whitetop (*Fluminea festucacea*), smartweed (*Polygonum hydropiperoides*) and a great deal of duckweed (*Lemna*). — GRAHAM COOCH, Ottawa, Ontario.

Arctic Fox on Cape Breton Island.—Reliable information regarding the occurrence of the Arctic Fox (*Alopex lagopus*) in the Gulf of St. Lawrence south of the Strait of Belle Isle is wanting. According to Captain H. M. Walters, Chief Game Warden for Newfoundland (by letter, 1948), it is an infrequent visitor to the coast of Newfoundland. Seton (Lives of Game Animals, Vol. 1, pt. 2, p. 433) gives two records for Anticosti based on an article published in *Forest and Stream* by William Couper in 1877. The first and only record of its occurrence on Cape Breton Island is that of a specimen taken at Laing Bay in 1923 (J. L. De Vany, "Arctic Fox Shot in Cape Breton", Canadian Field-Naturalist, Sept. 1923, p. 118). In view of the paucity of published records it seems desirable to record the following:

Early in May, 1935, the residents of Port Hood Island, Cape Breton, reported a small white "dog", observed feeding on offal along a rocky shore. The unusual appearance and singular behaviour of the animal as reported by them, prompted me to investigate further. After several fruitless attempts, I was rewarded by catching sight of the animal which proved to be an Arctic Fox (*Alopex lagopus*). Evidentally unaccustomed to man, it could be closely approached and examined carefully. The diagnostic characters — long, narrow muzzle, bushy tail, and pure white coloration, were plainly visible.

Several days later it was captured by Mr. I. D. Cameron, and held in captivity for a period of 18 months on his ranch at Port Hood Island. Mr. Cameron has kindly provided the following data:

Although unusually tame prior to capture, it proved to be very timid in captivity. Not only was it obviously afraid of its human attendants, but also of the red foxes (*Vulpes fulva*) in the adjoining pens. Needless to say, attempts to crossbreed it with the latter were unsuccessful. The fish diet which it received was apparently adequate, as it remained in good health and the biannual molts progressed in an orderly fashion. In the autumn of 1936, it was pelted and the skin sold to a fur dealer who further confirmed my identification.

It is believed that this animal reached the Island on an ice floe which moved into St. George's Bay early in May, 1935. — Austin W. Cameron, National Museum of Canada, Ottawa.

Cat-Fox Association. — Several instances of the association of the red fox (*Vulpes fulva*) and the domestic cat (*Felis domestica*) have been noticed in the southern Algonquin Park area. This was first noticed by me during the summer of 1948. Several cats, presumably abandoned at one time by a logging camp had apparently gone feral in the neighbourhood of Little McCauley Lake. Several times these cats were noticed during our trips into the lake, but any attempt to approach them was always quite unsuccessful.

During one of these trips, we rounded a bend and noticed a red fox and one of these cats sitting within a foot of each other, at the side of the road. As we approached, they fled into the bush together. The cat was apparently quite used to the idea of the fox being so intimate, or vice versa.

This fox-cat association was noticed again in 1949 at Lake Opeongo. This time I noticed a cat, belonging to the tourist lodge on the lake, and a fox wandering together in a clearing behind the lodge. They finally disappeared into the bush, still together.

I also found that similar observations have been made for a pet cat belonging to one of my co-workers, N. Martin, at the Fisheries Research Laboratory at Lake Opeongo. Several evenings when leaving his cottage to bring his cat in for the night he shone his flashlight on the fox and cat together immediately outside the cottage. Apparently the fox was a frequent visitor to the cottage while the cat was there. — F. H. SCHULTZ, *Dept. of Zoology, University of Toronto.*

Bobolink at Cochrane, Ontario.—A male bobolink (*Dolichonyx oryzivorus*) was observed on June 5, 1949 in a meadow at Little Bell Lake, about five miles north of Cochrane, Ont. It was repeatedly giving its flight song, but no female could be found. This appears to be the most northerly record of the species in this area, although it is only slightly north of the breeding ground at Lake St. John, Que. — D. B. O. SAVILE, Division of Botany and Plant Pathology, Dept. of Agriculture, Ottawa.

Unusual Behaviour of Wilson's Snipe.— Wilson's snipe, *Capella gallinago,* disturbed on Moose Island, near Moosonee, Ont., during the second week of June, 1949, did not usually utter the well-known 'scaipe' note and dart off in zigzag flight. Instead they would fly about the observer, usually at ranges of ten to thirty yards, giving a slightly nasal 'yak' generally repeated three to eight times at intervals of half a second, then pausing for some seconds and repeating the performance. This behaviour would continue for several minutes with one or two birds taking part. A group of six birds, apparently migrants, disturbed near Ottawa on April 30, all gave a similar display for more than fifteen minutes with usually two to four doing so simultaneously, while the others would sometimes fly off to perform the winnowing courtship flight briefly and return to fly about the observer again. This behaviour continued until I left. Bent[1] quotes E. W. Nelson as describing a similar performance by birds on their breeding grounds in Alaska; but I have seen no other record of it.—D. B. O. SAVILE, Division of Botany and Plant Pathology, Dept. of Agriculture, Ottawa.

[1] Life Histories of North American Shore Birds. Part 1, 1927.

The Roosting Behaviour of a Snow Goose at Montreal. — One of the most interesting observations made on the Christmas bird-census at Montreal on December 19, 1948 was that of a Snow Goose *(Chen hyperboreus)* observed by J. Anglin, J. Pollock, D. Ryan and the writer. The goose was probably a young bird, judging by its greyish-brown plumage, with an injured right leg which hung down during flight. Its size was very small, scarcely larger than that of some herring gulls *(Larus argentatus)* with which it settled on the water.

The bird was first seen on Goat Island in the St. Lawrence arising from the lawn of a summer cottage facing approximately northwest towards the river. Later upon our return past the cottage the bird was seen standing on the lawn. A closer inspection of the lawn revealed a peculiar pattern of the bird's excrement. The droppings were arranged in a broad semi-circle whose open side faced the river while the base of the semi-circle was at the rear of the lawn. There were about one hundred separate piles of excrement indicating that this roost had been used for at least several days. The shape of the roost suggests that the bird probably faced towards the river at all times moving along the arc of the semi-circle in relation to the movement of the sun and the extent of visibility on the river. — D. M. SCOTT, Dept. of Zoology, McGill University, Montreal, Que.

The Semipalmated Sandpiper *(Ereunetes pusillus)* **in Southwestern New Brunswick.** — Moore [1] states that the semipalmated sandpiper is rare in New Brunswick. This remark may apply to the interior of New Brunswick but its validity coastwise is contradicted by my experience in the vicinity of St. Andrews, N.B. where this species is the most abundant shorebird during the fall migration. At low tide the extensive mudflats are the feeding grounds for hundreds of semipalmated sandpipers in August and September. Upon one occasion in August, 1948, I found a night roost of this species containing not less than two thousand birds. Its abundance in this region has already been recorded by Pettingill [2] who considered the species as an "abundant transient". This sandpiper is rare in the spring; I have only seen a few individuals at this season and it is possible that Moore's knowledge of this bird was restricted to the spring migration.

1. Moore, W. H., 1928. "A list of New Brunswick birds"., 24 pp., Fredericton Science Club.

2. Pettingill, Jr. O. S., 1939. "The Bird life of the Grand Manan Archipelago". Proc. Nova Scotian Inst. Sci., Vol. XIX pt. 4 pp. 293-372.

— D. M. SCOTT, Dept. of Zoology, McGill University, Montreal, Que.

Kodachrome slides of Canadian birds.—Of interest to naturalists, teachers, and others who lecture on birds is a new series of 2 x 2 Kodachrome slides now obtainable from the Royal Ontario Museum of Zoology, 100 Queen's Park, Toronto 5, Ontario. Approximately 150 species of Canadian birds are represented, the price being $1.00 per slide.— W. E. G.

The first record of the Chiselmouth, *Acrocheilus alutaceus* Agassiz and Pickering, from British Columbia, Canada. — A single specimen of chiselmouth was obtained by gill net on July 22, 1948, in Skaha lake, British Columbia. The net was set in approximately fifteen feet of water at the mouth of the Okanagan river at the north end of the lake.

Skaha lake is on the upper reaches of the Columbia river drainage, in the Okanagan valley, immediately south of Okanagan lake.

The appearance of this specimen represents a considerable northward extension of the known range for the species. Schultz and DeLacy (Journ. Pan-Pac. Res. Inst., **10**(4), (1935) record the general range as the lower Columbia river system and Malheur lake drainage, Oregon, but also include records of specimens taken in the Spokane, Washington area, which is above the junction of the Okanagan and Columbia rivers.

The measurements and counts of the specimen taken were: length 20.5 c.m. standard length; lateral line scales on right side 87; fin rays: dorsal 10, anal 9, pectorals 17, pelvic 9; colour brownish with orange under bases of pectoral and pelvic fins.—R. G. FERGUSON, *Department of Zoology, University of British Columbia.*

REVIEWS

The Sandhill Cranes. *By Lawrence H. Walkinshaw. Cranbrook Institute of Science, Bull. 29, 1949, pp. I-X, 1-202, pls. 1-17.*

In the past fifteen years the author has travelled some 70,000 miles in Alaska, Canada, the United States, Cuba, and the Isle of Pines to study the four known races of the Sandhill Crane, *Grus canadensis*. Sections of the book are devoted to plumages and molts, voice, behaviour, food and feeding habits, pairing and territory, nesting, and the young. Another section deals with this crane in the fall, winter, and spring seasons and there also is a history of North American crane populations.

Appendix A is a Key to the Cranes of the World. Appendix B presents the distributional information known to the author, these date being arranged seasonally and subspecifically. The breaking down of some of the field observations into subspecies was undoubtedly a difficult undertaking. In one case (p. 168) a small breeding female and a set of eggs from near Yorkton, Saskatchewan, is identified as probably *canadensis* while on page 173 apparently the same female and set of eggs are referred to *tabida*. It would seem best to refer them to the latter.

The detailed information brought together in this book is well organized and interestingly presented. One is impressed with the abundant detailed information which is a result of the author's own observations. There is a bibliography and an index. — W. EARL GODFREY

The Siphonaptera of Canada. *By George P. Holland. 306 pages, 44 distribution maps, 42 plates containing 350 figures. Technical Bulletin No. 70 of the Dominion of Canada, Department of Agriculture.*

The Siphonaptera of Canada by George P. Holland issued September 1949 (actual mailing date, December 6, 1949) is a major contribution to the knowledge of the Siphonaptera of North America and is essentially a taxonomic monograph. It supplements the previous books: Fleas of Eastern United States, by Irving Fox, 1940, and Fleas of Western North America, by C. A. Hubbard, 1947.

Most of the work on this volume was done by Mr. Holland while at the Livestock Insects Laboratory, Kamloops, British Columbia, and he personally collected many of the specimens used in this study. Mr. Holland has now been transferred to Systematic Entomology, Division of Entomology, Ottawa, Ontario. [1]

One hundred twenty-seven species and subspecies of fleas representing five families are treated in this monograph. Six species included, are believed to be introduced from Europe or Asia.

Introductory sections are devoted to acknowledgements (which are generous), synopsis of families, genera and species, distribution by Provinces, notes on life history

[1] Chief, Unit of Systematic Entomology, Division of Entomology, Science Service, Canada Department of Agriculture.

and ecology, host specificity, geographical distribution, notes on the relationship of Nearctic and Palearctic fleas, economic importance of fleas, notes on anatomy as applied to systematics, and the problem of flea taxonomy.

A key to the genera which has received much careful consideration introduces the real taxonomy section which is arranged by families, genera, and species, respectively. Each species is given separate consideration with a bibliography, distribution map, and figures of critical characters, interesting notes on relationships, host and geographic distribution, and specific collection records including locality, date, host, number of specimens collected and collector.

Tedious and lengthy redescriptions of well-recognized species giving bristle counts and measurements are omitted. New species and subspecies are adequately described and figured. A comprehensive host-flea index indicates the author's opinion on (1) true host-parasite relationships, (2) doubtful, and (3) obviously accidental host records which are very numerous in fleas. This is based on the collection and examination of many thousands of specimens. An appendix discusses notes on collecting methods, mounting techniques, and a glossary of collectors. The bibliography covers 12 pages.

The 42 plates of 350 line drawings including critical characters of every recognized Canadian species demand special mention. They are superior in choice of subject, in accuracy, in technique of execution, and in reproduction. These are all original drawings by Mr. Holland and it may be said that preparation of this book was delayed at one time by prolonged eye fatigue or failure in making these camera lucida drawings.

In the systematic arrangement of Ceratophyllidae, Holland has used the basic division into genera proposed by Jordan 1933 instead of the revision by Ewing and Fox 1943 which has in general been rejected by students of North American fleas.

Described as new are:

Hystrichopsylla occidentalis
Hystrichopsylla spinata
Callistopsyllus campestris
Peromyscopsylla hesperomys pacifica
Megabothris obscurus

The hitherto unknown male of *Megarthroglossus divisus exsecatus* Wagner, and the females of *Tarsopsylla coloradensis* (Baker) and *Malaraeus euphorbi* (Rothschild) are described. A new subfamily, *Nearctopsyllinae*, is proposed. *Monopsyllus bakeri* (Wagner) is shown to be a synonym of *M. thambus* (Jordan). *Opisodasys jellisoni* Fox is considered a synonym of *Tarsopsylla coloradensis* (Baker).

Most of the collections are from specifically determined hosts, giving adding value to these host-parasite records.

An impressive list of Canadian naturalists, trappers, Royal Canadian Mounted Police, clergymen, and others have contributed specimens to this study.

It is a pleasure to see this volume added to the literature on ectoparasites. — W. L. JELLISON.

Bird-Watching. *Fifteenth Annual Report of the British Trust for Ornithology, 1948 (1949), pp. 1-49.*

This interesting report outlines some of the ornithological problems investigated by the British Trust for Ornithology during 1948. Considerable emphasis on population densities is apparent. There are well-organized long-term censuses of such species as the Great Crested Grebe, the Hobby, and the Black Redstart, as well as of the heronries in the British Isles. Extensive studies of the migration of waders, terns, and swifts are being made. A particularly worthwhile study, by the Edward Grey Institute, of factors influencing numbers of the Great Tit, *Parus major*, is begun.

The opening of milk bottles and the drinking of the milk by birds, first recorded in the British Isles in 1921, has become widespread in many parts of England and less extensively in Scotland, Wales, and Ireland. This behavior was investigated by the B.T.O. The vast majority of the attacks on milk bottles, it was found, were by two tits, *Parus major* and *P. caeruleus*, although 11 species of birds have been reported obtaining food in this way.

An apparently effective system for the collecting of nesting date is being carried out by the British Trust for Ornithology. Cards on which data can be written in by the observer are sent to cooperators. When these are completed they are returned to the files

of the B.T.O. and a mass of definite information is thus being accumulated. Such a system could be emulated with profit elsewhere. —W. EARL GODFREY.

Mammals of North America. *By Victor H. Cahalane. The MacMillan Co., New York, 1947; x + 682 pages; Illus., with drawings by Francis L. Jacques. $7.50.*

As the author points out in his introduction, the present volume is intended primarily for the laymen. From the great mass of published technical and semi-technical material that has appeared down through the years, Mr. Cahalane has extracted the most significant facts and translated them into language intelligible to the average reader. Such a task is by no means an easy one and the author is to be complimented on an excellent job.

With the interests of his readers clearly in mind the author deals first with the larger, and to the man on the street, more interesting mammals. Avoiding the technical classifications generally employed in works of this kind, he groups the mammals under such headings as "The Deer Family" (moose, caribou, deer, etc.), "Original American Livestock" (bison, muskoxen, goats, etc.), "The Musk-carriers' (weasels, otter, skunks, etc.), and so on. Within these higher categories he treats each species independently, giving the common and scientific names, general description, distinguishing characteristics, and distribution. As might be expected, emphasis is placed on pertinent facts pertaining to habits and life history. Drawing his material from numerous published sources as well as from personal observations, he writes a scientifically accurate yet highly entertaining account of each mammal, dealing with such subjects as behaviour, breeding, hibernation, predators, and numerous other topics. With regard to behaviour, his anthropomorphic interpretations may irritate the scientist, but they will delight the layman, for whom, after all, the book was written. There is an excellent bibliography which should prove extremely useful to both scientist and layman. The black and white drawings by the famous artist, Francis L. Jacques add immeasurably to the value of the book. — AUSTIN W. CAMERON.

Introducing the Insect. *By F. A. Urquart. Illustrations by E. B. S. Logier. Clarke Irwin & Co., Toronto. Price $5.00.*

As the author makes clear in the preface, this book was intended for the amateur entomologist; to help him in collecting, preserving and studying the insects he finds; to assist in the identification of the common insects to the proper Family, and to guide his studies of insects and their habits in the early stages. Identification keys are provided for the common families of insects and are well illustrated. For a closer identification of his collections the student must go to more advanced texts or to specialists.

The first chapters deal with making insect collections, and, briefly, with anatomy and life history. The chapter on classification and identification is an exceptionally fine introduction to a difficult subject. The remaining chapters deal with the commoner Orders and Families, giving a general account of the Order and a key to the common Families in the Order, followed by a discussion of habits and life-histories in each Family.

The insect habits and life-histories are dealt with at considerable length and in a manner likely to awaken and hold the interest of the young reader. The illustrations are exceptionally good. They include four good colour plates, 160 line-drawings and many additional line-drawings illustrating the keys.

The identification keys serve their purpose well and are illustrated so effectively that one wonders whether the amateur will trouble to use the text.

The design of the book is good and a fairly even balance is held in the treatment of the groups. While an entomologist would find a few minor defects, there are none of great importance, but it might be suggested that the second edition would be improved by an expansion of the keys and of the text of the more important Families, and that more attention to the economic species could add a great deal of interest.

Introducing the Insect should be in the library in all our schools which teach Nature Study and certainly no amateur entomologist in this country can afford to be without it. — J. M. SWAINE.

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Vol. 64 SEPTEMBER-OCTOBER, 1950 No. 5

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The Canadian Field-Naturalist

Vol. 64 OTTAWA, CANADA, SEPTEMBER-OCTOBER, 1950 No. 5

ABUNDANCE OF CERTAIN MAMMALS OF THE GERALDTON FOREST DISTRICT, ONTARIO [1]

C. A. Elsey
Toronto, Ont.

IN THE WINTER of 1947-48, the author undertook to start a programme of general mammal studies in the Geraldton District of northwestern Ontario. The first step was to establish a picture of the distribution of the various mammals. This article contains a report on the information obtained in the preliminary survey. The use of the terms "abundant", "common", and "rare" are the writer's opinion of the status of the species concerned. The Geraldton District is very large, and probably many of the estimates are incorrect. If this study were continued for a number of years, and a true picture of the mammal population obtained, it would be possible to relate their numbers and movements to food supplies, timber operations, forest cover, advance of civilization, hunting and trapping pressure, environmental factors. With this information it will be possible to plan a management programme calculated to maintain the district at the optimum level for all species.

The information contained in this report was obtained partly through airplane, automobile, hiking, snowshoe and canoe trips. A Tiger Moth was used in the air surveys. This plane was found to be most satisfactory because of the low altitudes at which it could safely fly, its low airspeed, and the ease with which it could be landed on small lakes. Much information was also gleaned from discussions with trappers.

Mr. U. W. Fiskar, the District Forester at Geraldton, spent a great deal of time and energy in assisting in the collection of the information for this report.

Beaver

The density of beaver is indicated on the accompanying map (fig. 1).

It is interesting to note that five new dams and houses have been found where the available food supply consists of evergreens only. In these cases suitable sites for dams and houses, having a food supply of aspen and willow were near, and easily accessible. Evergreens had been cut recently and used in dam construction, but the extent to which they had been used as food is not known.

Canada Lynx

In general the lynx population of the Geraldton District is said to be decreasing possibly towards extinction. However, trappers have reported a few local increases during the past year (fig. 2).

Marten and Fisher

The population of these species in the Geraldton District is at a very low ebb. In discussing the problem with the trappers, it was learned that most of them have none or at most 2 or 3 pair of either or both species.

Moose

The Geraldton District seems to be one of the last strongholds of the moose (fig. 3). In a few places there are signs of overgrazing. However, the overgrazing is not excessive, and there are areas of adequate food supply nearby.

Otter

Because otters are difficult to trap they are relatively abundant in the Geraldton District. In most localities they may be described as common, while in a few areas they are abundant. They have used the Nipigon-Onaman Crown Game Preserve to advantage.

Raccoon

A raccoon was caught in the fall of 1946 north of Longlac by an Indian. As the animal was about one and one-half miles from the railway, it is suggested that it may have entered the Geraldton District by rail.

[1] Received for publication January 12, 1950.

Vol. 64, No. 4, July-August, 1950, was issued November 13, 1950.

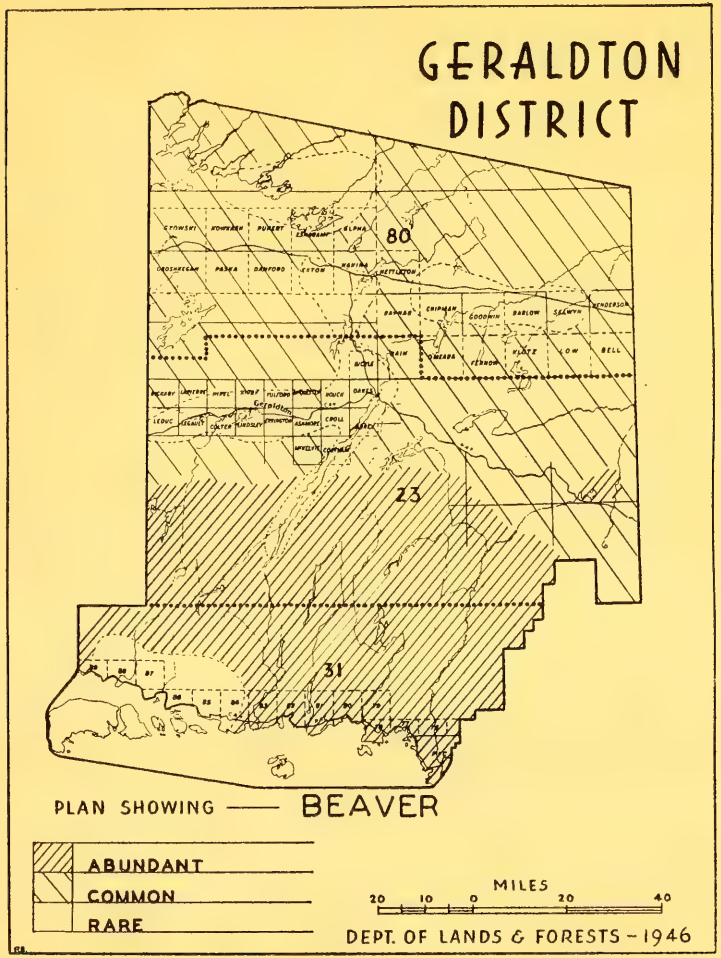

Fig. 1. Density of beaver.

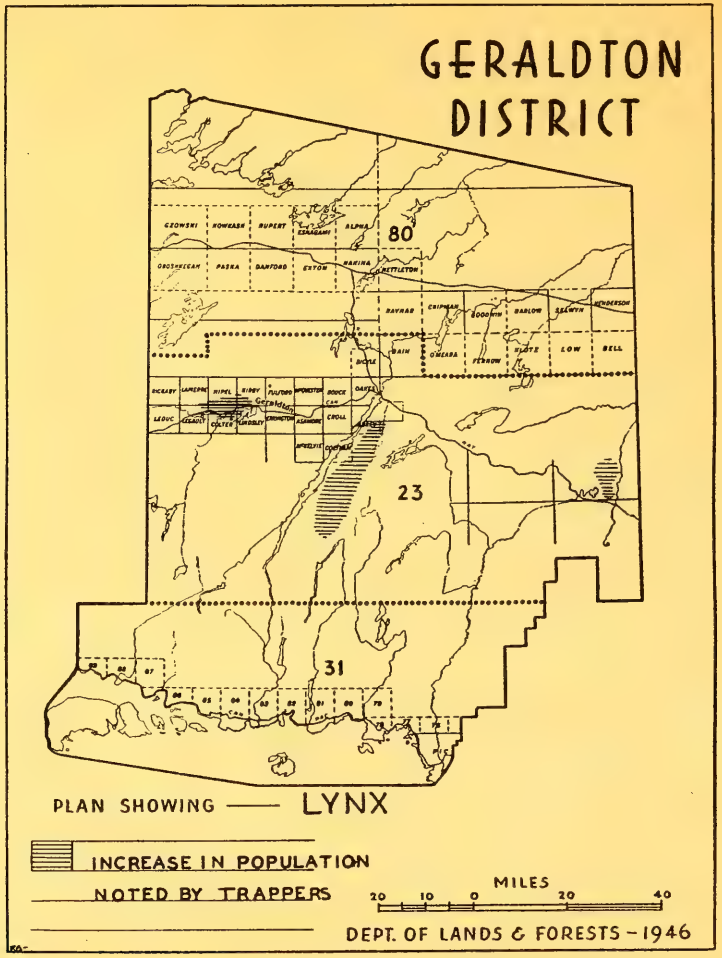

Fig. 2. Density of Canada lynx.

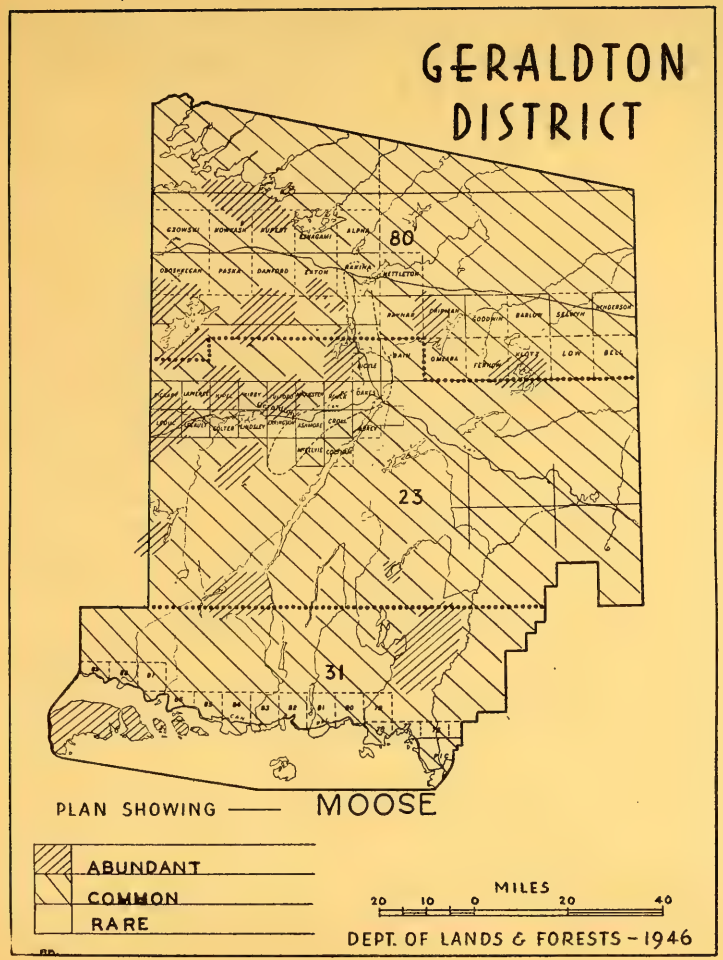

Fig. 3. Density of moose.

Fig. 4. Density of timber wolf.

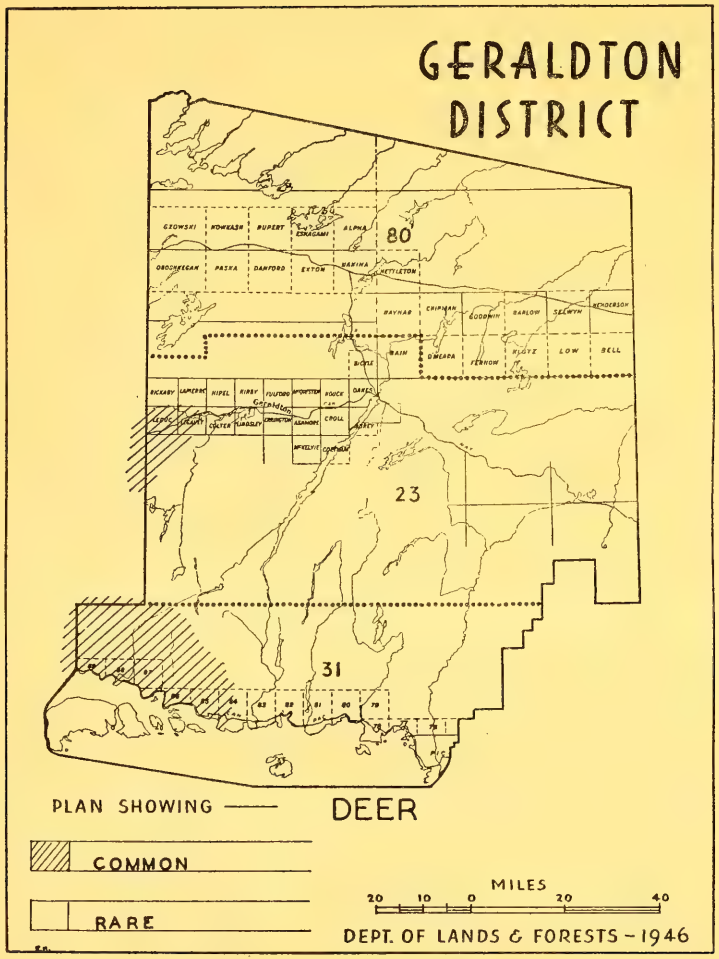

Fig. 5. Density of white-tailed deer.

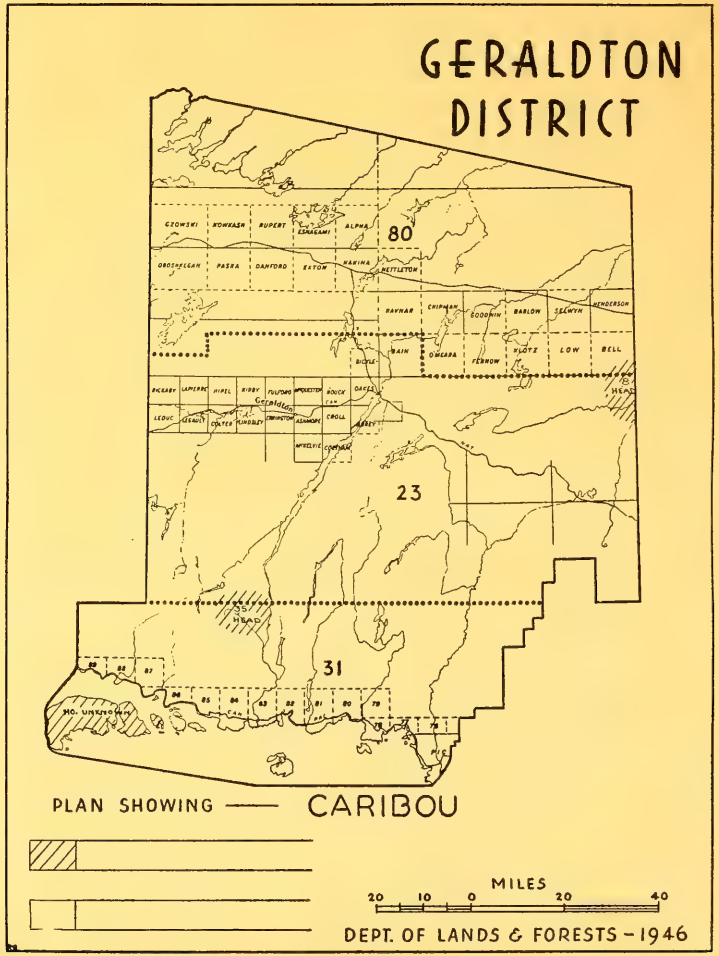

Fig. 6. Density of woodland caribou.

Timber Wolf

The accompanying map (fig. 4) will indicate the abundance of wolf. It is generally thought that wolves are very abundant in this district, but in the opinion of the writer the indications are to the contrary. In areas marked "rare" the Indian trappers report that they have seen none or only one set of tracks this last winter. The centres of greatest abundance are relatively near to human habitations. The density pattern is similar to that of the snow-shoe rabbit, although there were no signs that the wolf had been feeding on rabbit. A few deer or moose kills were noted this winter but these incidents were so rare that little significance is attached to them. The coyote is found in this district but seems to be out-numbered by the timber wolf. Only nineteen bounty claims were paid last winter. Apparently the bounty is not much incentive to kill wolves here. The writer seriously doubts that there is any need for a wolf bounty payment in non-agricultural areas. There is no evidence that the wolves seriously interfere with any of our game or fur-bearing mammals. If these animals were a very serious problem here, more bounty claims would have been registered by the trappers.

Wapiti

Four specimens have been reported during 1948. Three of these were in the Nipigon-Onaman Crown Game Preserve and one within a mile of the Preserve. Elk were placed here several years ago in the fall. It was reported to be a severe winter and no elk were reported until last year. Three of those seen were young animals; one was an old bull.

White-tailed Deer

The white tailed deer is not common in the Geraldton District (fig. 5). The limiting factor in its distribution is not known. Food supply, water, temperature and depth of snow all seem to be satisfactory as compared to other districts.

There have been some indications that the deer may be moving gradually into the settled portions of the Geraldton District. In other areas the Indians report a former abundance of deer and a present scarcity.

Woodland Caribou

The caribou is in serious danger of extinction in the immediate future (fig. 6). Probably not more than about fifty or sixty of these animals still survive in this district.

Observation trips into the woods indicate a fair amount of the lichens suitable for caribou winter forage. However, a highly concentrated food supply has been observed in only a few places.

SIZE OF SUMMER BIRD GROUPING, TEXAS TO THE YUKON[1]

LEONARD W. WING
Texas Agricultural and Mechanical College, College Station, Texas.

FOR YEARS automobile driving to me, as to many others, usually had been chiefly a means of getting from one place to another. But several years ago, I began to record systematically the size of bird flocks while driving, as well as while in the field. It thus gives some value to the time consumed in driving and even gives a few data of bird flocking habits.

Only species that can be identified readily and counted quickly are usable for this gathering of flock data from a moving car. A driver must watch the road carefully, which limits his counting, but those that he can count have some comparative value in flock studies. I am often able to obtain sex counts also, as of Mountain Bluebirds.

A "group" or "flock" for this purpose consists of any number of birds separable into units recognizable as such. Single birds, as found in the breeding season for example, should be considered as a "group". Obviously, group counts made from a moving car are "conservative", for members of a group can be missed easily when counting in motion. Despite popular acclaim for "conservative" data, I really see no greater reason for pride in these "conservative" figures than in liberal ones. So far as scientific accuracy is concerned, an error

[1] Received for publication March 6, 1950.

on the "conservative" side seems to be as much an error as one on the liberal side. It must be our desire to appear modest that makes us like "conservative" figures, because it doesn't seem to change the fact of error in the least!

I keep a small note pad attached to the dash of my car, along with an altimeter and watch. I write down the counts as shown in Figure 1, which is here used for illustrative purposes only; the records are little different than the original. Commas are omitted because car motion may turn them into apparent numerals, but I encircle all numbers above ten to distinguish them from single numbers. I also abbreviate bird names for convenience.

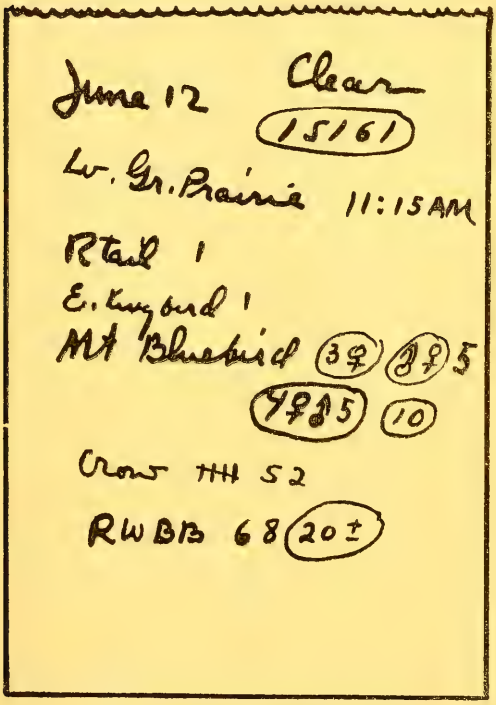

Fig. 1. Sample notepad record.

The condensed note shown states that on June 12, 1948, we left Grand Prairie, Alberta, at 11:15 A.M. The speedometer read 15,161 miles. The difference between this and the next reading will give the mileage for the counts noted. The day was clear. I was able to record the following flock counts:

Red-tailed Hawk 1

Eastern Kingbird 1

Mountain Bluebird 30 (in groups as follows: three females, a male and female, five birds of unknown sex, a group of four females and one male along with five of unknown sex, a flock of ten of unknown sex.)

Crow 17 (five birds seen singly, five in a group, and two in another group)

Red-winged Blackbird 34 (in three groups of six and eight as counted and one group estimated to contain twenty).

On a trip from College Station, Brazos County, Texas, to the Yukon, June 3-16, 1948 for some field study*, I recorded a total of 2,151 groups of birds. These data and others gathered later give some indication of the flocking of birds in summer. The geographic distribution shows a slight increase in group size north of Edmonton, Alberta, as indicated on the map of Figure 2. The explanation seems to be the later progress of the season as one backs into spring going northward (Table 1).

Our return began at noon of August 19 (Yukon or 135th Meridian Time), and we reached College Station again September 4. A total of 673 flock counts resulted from the counts going south, which includes 164 groups seen northwest of our base camp at Johnson's Crossing of Teslin River during the few days before the 19th. The total differs from the northward recording by almost fifteen-hundred groups, which difference is accounted for in part by rainy weather that rendered birds less active and observations more difficult and in part by some night driving and in part also by the increase in family size of birds and scattering of individuals.

The total birds for the 2,151 flocks in early summer was 2,531 and that for the southbound record of 673 flocks totalled 3,367. These give averages of about 1.2 and 5.0 birds, respectively. The 246 flocks counted in the summer totalled 619 birds and averaged 2.1 each.

The highest count for the late summer return trip occurred between Edmonton and the International Border, where thirty-two flocks averaged 19.9 birds each. The size along the Alaska Highway and adjacent area to the North (North of Johnson's Crossing in Table 2) reflects the tendency of forest birds to be less gregarious than nonforest ones. The decline in flock size from Idaho

* A research project made possible by a grant from the Arctic Institute of North America.

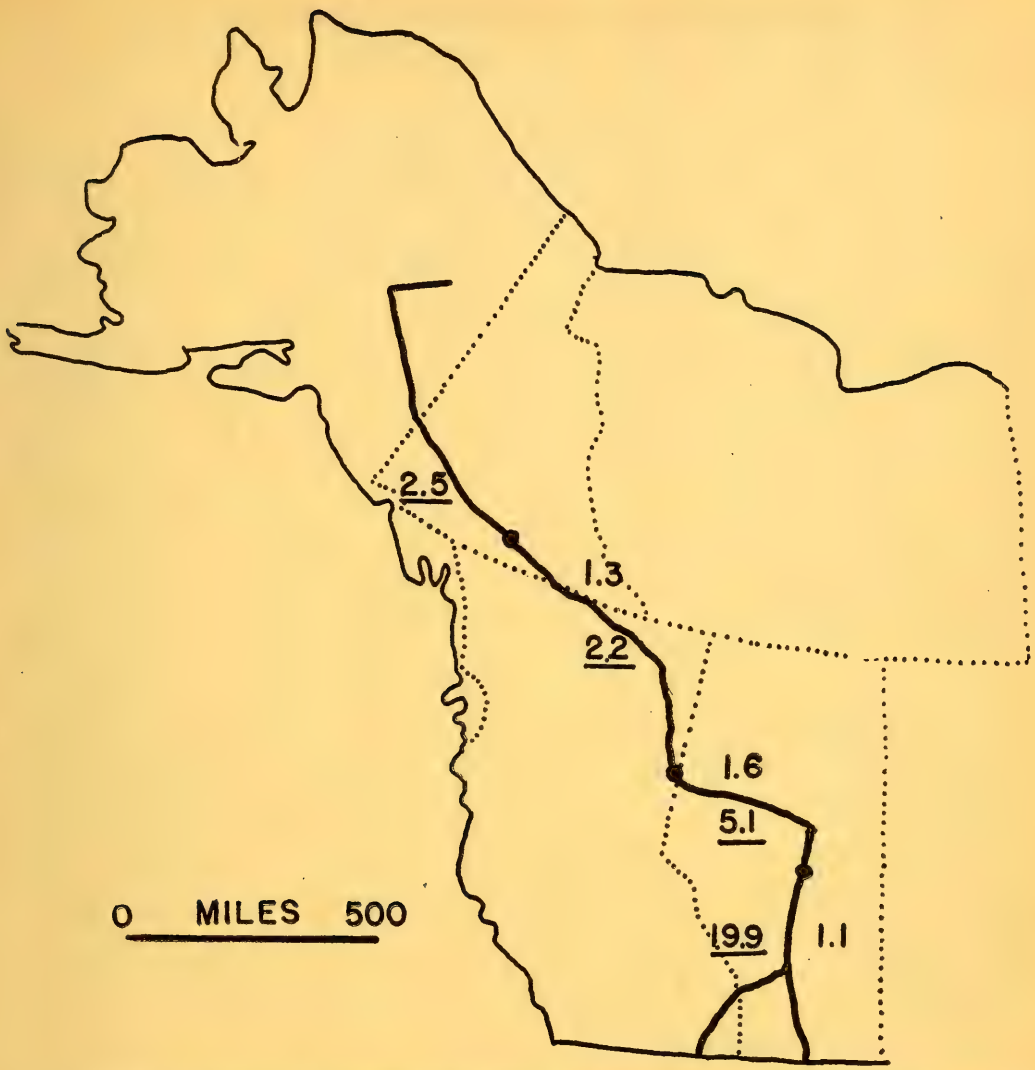

Fig. 2a. Area travelled and averages by sections. The underlined figures are return-trip averages. The heavy dots represent Edmonton, Dawson Creek, and Johnson's Crossing from south to north respectively.

southward no doubt can be accounted for by the later flocking together of more southerly birds in comparison with more northerly ones. The average for counts within the species shows the same trend of decrease from north to south, which undoubtedly reflects the earlier foretaste of winter farther north.

During the summer, I collected 246 group counts that average 2.1 birds each as shown in Table 3. A review of the summer field data gives some indication of flock inception in summer. Several species congregated together in late July in favored spots, such as along the Teslin River or in brushy areas near by, but the lack of flock consciousness precluded designation of this as flocking. But it probably was the assembling of birds that forms the prelude to flocking for fall migration. Among the species so congregating were the Slate-colored Junco, Robin, Chipping Sparrow, Gambel White-crowned Sparrow, and Yellow Warbler.

A number of birds stayed in small groups most of the summer, and were still in these small groups on August 19. The largest

Table 1. BIRD FLOCKS COUNTED NORTHBOUND, TEXAS TO THE YUKON

	Texas	Oklahoma	Kansas	Colorado	Wyoming	Montana	Border to Edmonton	Edmonton to Dawson Creek	Alaska Highway (to Johnson's Crossing)
Turkey Vulture	2.2		1.0						
Hawk (sp)		1.0		1.0	1.0	1.0	1.0	1.0	
Goshawk									1.0
Golden Eagle									1.0
Pigeon Hawk (Merlin)								1.0	
Sparrow Hawk (Kestrel)				1.0		1.0	1.0	1.0	1.0
Killdeer	1.0		1.0	1.0	1.0	1.0	1.0		
Kingfisher									1.0
Mourning Dove	1.2	1.1	1.4	1.2	1.5				
Yellow-sh. Flicker							1.0	1.0	1.0
Red-sh. Flicker					1.0				
Eastern Kingbird		1.0	1.0	1.0	1.2	1.2	1.2	1.0	
Western Kingbird	2.0	1.2	1.1	1.2	1.2	1.4			
Scissor-tailed Flycatcher		1.4							
Canada Jay								1.0	3.0
Blue Jay		1.0							
Raven								2.0	1.3
Crow		1.6	1.2		1.0	1.1	1.1	1.9	
Black-billed Magpie			1.0	1.0	1.1	1.0	1.0		
Eastern Bluebird	1.0								
Mountain Bluebird							1.0		
Loggerhead Shrike							1.0		
Eastern Meadowlark	1.0	1.5							
Western Meadowlark		1.0	1.0	1.0	1.0	1.0	1.0		
Redwinged Blackbird		1.0	1.1	1.0	1.0	1.1	1.1		
Cowbird							4.0		
Brewer Blackbird					1.0	1.2	1.0	1.8	
Bronzed Grackle	2.0				1.3	1.1	1.0	1.3	
Lark Bunting					5.0				
Pine Siskin								4.0	
TOTAL NUMBER OF GROUP COUNTS	52	108	171	164	363	424	527	310	27
AVERAGE GROUP SIZE	1.1	1.3	1.1	1.0	1.1	1.1	1.1	1.6	1.3

flock of Hudsonian Chickadees, for example, totalled six on July 25, but Chickadees usually went about in groups, perhaps families, of three to four birds. The Pine Siskin usually went in flocks of four or five but a flock estimated to number about twenty-five was also seen on July 25. The Canada Jay always seemed to be in small groups of one to two adults with a few young, which probably represented family groups. Perhaps most of the small assemblages of resident species were family groups.

But observational evidence of flock accumulation occurred in many species. The Herring Gull, for example, usually patrolled the river in small numbers and singles. But on July 29 a flock of eighteen passed on up the river going Southeast, which may have been the start of premigration or even mi-

Table 2. BIRD FLOCKS COUNTED SOUTHWARD, YUKON TO TEXAS

	North of Johnson's Crossing	Johnson's Crossing to Dawson Creek	Dawson Creek to Edmonton	Edmonton to Border	Border to Southern Idaho	Southern Idaho to New Mexico	New Mexico to Texas
Turkey Vulture							2.1
Black Vulture							1.0
Cooper Hawk	1.0	1.0	1.0				
Redtailed Hawk	1.0		1.0				
Harris Hawk							1.0
Golden Eagle	1.0						
Bald Eagle	1.0						
Marsh Hawk	1.0	1.0	1.0	1.0	1.0		
Osprey	2.0						
Pigeon Hawk (Merlin)	1.0						
Sparrow Hawk	1.4	1.2	1.1	1.0	1.8		
Spruce Grouse	(11.0)						
Rock Ptarmigan	4.5						
Ruffed Grouse	2.0	3.0	6.0				
Sandhill Crane	21.8						
Killdeer					1.0		
Short-eared Owl			1.0				
Horned Owl	1.0						
Kingfisher			1.0		1.0		
Mourning Dove					4.5	2.1	1.3
Yellow-shafted Flicker	1.7	1.0	1.2				
Red-shafted Flicker					1.0		
Eastern Kingbird			3.7	3.8	2.0		
Western Kingbird						1.5	1.3
Say Phoebe	1.1	1.0	1.0				
Cliff Swallow	6.0						
Canada Jay	1.5	1.8	1.0	1.0			
Black-billed Magpie	3.0		3.3	5.2	1.6	2.0	
Raven	1.4	1.0			3.0	2.1	
Crow			10.1	1.7	5.5		
Pinon Jay						2.1	1.5
Robin	2.5	1.0	1.0	3.0	1.5		
Mountain Bluebird			1.0	3.5	5.3	2.0	1.3
Townsend Solitaire	1.0						
Bohemian Waxwing	35.5	50.0	9.0				
Northern Shrike	1.0						
Loggerhead Shrike						1.0	1.0
Western Meadowlark			1.0		1.6		1.0
Redwinged Blackbird				(500)			
Brewer Blackbird			87.3	32.0	35.5	10.9	
Bronzed Grackle			20.0				
Pine Siskin			2.0				
TOTAL NUMBER OF GROUP COUNTS	164	47	89	32	148	91	102
AVERAGE GROUP SIZE	2.5	2.2	5.1	19.9	8.2	2.9	2.0

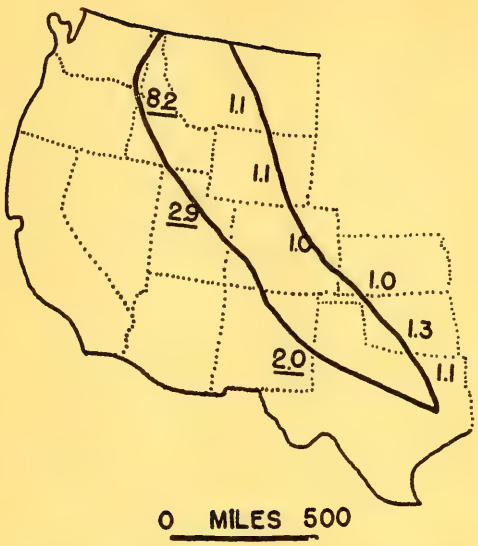

Fig. 2b. Southern part of area travelled and averages by sections. Underlined figures are return-trip averages.

gration movement. On August 1, I saw six Yellow-shafted Flickers in a flock; previously the birds had been in singles or pairs and rarely three or four. Bohemian Waxwings were noted in singles and pairs until July 17 when I counted forty-five in a flock. The first definite flocking tendency and migratory movement of the Nighthawk occurred together on August 1 when a flock of fifteen passed over.

I am unable to say what initiated the flock assembling, but it probably came about with the decline of daylight that was so noticeable in mid-July. The gonads of birds collected then were small compared to earlier, even though young birds had just left the nest and the breeding season was not yet far behind. Evidently the gonadal regression is extremely rapid in the Northland.

But it was not until the Cliff and Bank Swallows left so dramatically on the morning of August 3 that one became conscious of the passing evidence of summer and the coming of fall, even though it was early August. The congregating of birds for the fall migration became clearer after that, but the silence that followed the cessation of breeding activity blanketed the land and pressed upon the ears that strained to catch sounds in the soundless landscape as the eyes strain to see in the dark.

Table 3. SUMMER FLOCK COUNTS OF BIRDS BY SPECIES

Loon	1.5
Canada Goose	2.0
Baldpate	1.0
Greater Scaup Duck	2.0
Barrow Golden-eye	8.2
Bufflehead	1.3
White-winged Scoter	16.4
Surf Scoter	2.0
American Merganser	2.0
American Rough-legged Hawk	1.0
Redtailed Hawk	1.3
Bald Eagle	1.0
Marsh Hawk	1.0
Golden Eagle	1.0
Sparrow Hawk (Kestrel)	1.3
Blue Grouse (brood)	5.0
Spruce Grouse (brood)	4.0
Killdeer	1.3
Spotted Sandpiper	1.4
Lesser Yellowlegs	1.5
Semipalmated Sandpiper	2.0
Least Sandpiper	4.0
Herring Gull	4.8
Bonaparte Gull	2.0
Horned Owl	1.0
Nighthawk	3.2
Kingfisher	1.0
Yellow-shafted Flicker	1.7
Arctic Three-toed Woodpecker	1.0
Trail Flycatcher	1.0
Olive-sided Flycatcher	1.0
Wood Pewee	1.4
Canada Jay	2.4
Raven	3.8
Bohemian Waxwing	10.2
Golden-crowned Kinglet	4.0
Red-breasted Nuthatch	1.0
Hudsonian Chickadee	2.4
Robin	1.0
Mountain Bluebird	1.8
Olive-backed Thrush	1.7
Black-polled Warbler	1.5
Myrtle Warbler	1.2
Yellow Warbler	1.0
Wilson Warbler	1.0
Northern Waterthrush	1.0
Rusty Blackbird	4.0
Pine Siskin	9.8
Purple Finch	1.0
Slate-colored Junco	1.2
Chipping Sparrow	1.2
White-crowned Sparrow	1.0
Lincoln Sparrow	1.0
Song Sparrow	1.0
TOTAL FLOCKS	264
AVERAGE SIZE	2.1

Small groups of birds became more numerous, and I have used the end of the first week of August as the end of summer counts and the start of fall counts. I was unable to detect in the field any marked weather changes that seemed to influence or to stimulate flock formation, except that a series of cool, cloudy, damp days appeared to be followed by increase in flocking tendencies. But the small bird populations in the Arctic make exact measurement difficult. It would seem logical, however, that flocking is a prelude to migration and measures the increased gregariousness associated with decline in gonadal activity as the breeding season wanes.

THE *PEROMYSCUS MANICULATUS BAIRDII* COMPLEX IN MANITOBA[1]

STUART CRIDDLE
(Aweme), Treesbank, Manitoba

MOST OF THE INFORMATION given in this study of Baird's white-footed mouse has either been gathered within a few miles of my home at Aweme, or over the vast sand deposits known as the Spruce Woods Sandhills and the sandy prairies embracing them. Besides the information gained here, wide excursions have been taken into more remote parts of the Province with the object of collecting specimens, determining range, and gathering other information about this mouse and other natural history subjects of general interest. Our introduction to these interesting mice took place within a few days of our arrival here in 1882. While collections of natural history specimens were commenced during the following spring and grew rapidly as the years passed on, no real systematic work was undertaken until about 1895. By then we had made extensive collections and were sending specimens, or coloured drawings of them, painted by my brother Norman, to Dr. James Fletcher, Central Experimental Farm, Ottawa, and to Dr. C. Hart Merriam, Chief, U. S. Bureau of Biological Survey, Washington, D.C. These two great naturalists gladly named specimens, wrote most encouraging letters and helped us in many ways.

The widely different climatic conditions encountered and the great diversity of food available over the vast range of *Peromyscus m. bairdii,* has in the course of time developed marked variations in its colour and size. This is clearly shown in southern Manitoba, more especially in the Spruce Woods Sandhills, where there is still much free sand. Here the mice have developed a light tawny coat which matches the drifting yellow sand so closely that it is hard to see them when upon it. In the Riding and Duck Mountains we have another example of this adaptibility, where the mice are taking on a much deeper tone which is more in harmony with the dark coniferous forests in which they live. Where *bairdii* intermingles with other subspecies, as they do here on three sides, (*P. m. osgoodi* on the southwest, *P. m. borealis* on the northwest and *P. m. maniculatus* on the north and east), we get endless variations or intergrades, which make it impossible to delineate boundaries for any one of them. This uncertainty as to which subspecies, or intergrade is likely to be encountered in Manitoba makes the study of the white-footed mice one of the most absorbing subjects we have.

During the early stages of my mammalian studies, or hobby, my brother Norman gave me invaluable assistance, and my other brothers Evelyn and Talbot and my sister Maida continue to do so in many ways. They as always have my grateful thanks. Dr. R. M. Anderson, National Museum of Canada, Ottawa, and Mr. J. Dewey Soper, Wildlife Officer for the North-West Territories, friends of many years standing, have given freely of their expert knowledge and it gives me much pleasure to be able to acknowledge their many kindnesses here.

To show that these mice were just as abundant and destructive in pre-agricultural times as they are today I quote the following excerpt from my father's diary of 1882 when we were still living under canvas:

[1] Received for publication March 27, 1950.

"One very important factor in our Manitoba existence I must immediately bring the history thereof into the foreground. 'Tis when taken singly but a small and unimportant creature, but when joined by myriads of brothers, sisters, husbands, wives, grandmothers and children, a most serious and all-devouring monster. I refer to *The Mouse*. This little pest simply pervades the prairie in thousands and destroys everything. Unlike his English relative he can climb perpendicular walls and I believe get along the ceiling if not too even. No place is safe from him, and for the construction of his nest, wherein lies his greatest destructiveness, he is not contented with gnawing up and spoiling any one garment, but loving variety, he will take a bit of fur here, some wool there, the heel of a sock, the seat of a pair of breeches. Braid he dearly loves, and whenever he can get at anything especially prized or new, then he is in his element. We were some time ere we discovered what a terrible enemy we had amongst us. We had treated him as a pretty and harmless little friend whenever he showed himself to us, but when we did find him out a holy war was at once declared. A big hunt among our boxes and stores is our only way of paying him out and even then he is so nimble and clever that he often gets off Scot free. When we moved up to the hill there was a general rout and something like twenty of his race paid the debt of nature. But alas our victory was saddened by the awful discoveries of ruined clothes and sacked stores that came to light."

General description

These fascinating little mice are among the most clever of our small mammals. This is clearly revealed in such mannerisms as their choice of food, choice of nesting sites and choice of nesting materials. It is also evident in their ability to survive in such large numbers in spite of their preference for open places on the prairies, their habit of running along trails and pathways in summer and over the snow in winter. While usually most shy and unobtrusive they do occasionally become bold and inquisitive and at such times they are seen at their best, as their keen black eyes, so well adapted for seeing at night, appear abnormally large and bright. Their rounded ears with their fine white edges, are fully expanded and their long light and dark whiskers quiver with uncontrolled excitement. These features in addition to their spotless white and tan coat present a charm which at once places them among our most beautiful small mammals.

White-footed mice have large cheek pouches which allow them to gather food from distant parts of their home range and carry it back to their store rooms in comfort. Their sense of smell is extremely acute and enables them to detect cutworms, grasshopper eggs and other forms of insect life which may be an inch or more below the surface. Their front feet or hands are provided with sharp curved claws which enable them to climb nearly any object they may wish. They are also used in holding food which they are consuming and for holding hazel nuts and cherry stones while holes are being gnawed into them for the removal of the kernel. Their hind legs and feet are powerfully developed to suit their mode of travel, which is a succession of quick jumps or leaps, from a few inches in length to as much as eighteen or twenty when running at top speed.

Colour pattern

The colour pattern of these mice is very similar throughout their entire range in Manitoba and in brief is as follows: the lower parts of the body from the side of the nose to the base of the tail, including cheeks, fore legs and feet, are pure white. The tail is light brown to black above and white below. The ears are dark with a fine edging and often have a small white dot at the base. The colour of the upper parts of the body varies largely with age, season and locality, the greatest density being on the forehead, back and hind quarters, fading to lighter on the face, neck and sides.

Colour Variations and Distribution

Besides those zonal belts separating two or more subspecies, (in which there are endless variations in colour, size and length of tail), there are large tracts of land, "Islands", in which the mice breed, more or less, true to type. The two most important of which I know, are the Spruce Woods Sandhills and the Riding and Duck Mountain areas with many miles of country about them. From the southwest corner of the Province the mice show unmistakable

signs of being related to *P. m. osgoodi* and specimens from White Water lake, Melita and Tiger Hills north nearly to Kenton, show closer affinity to this western subspecies than they do to *P. m. bairdii*, or the sandhill form of *bairdii*, which is the most brightly coloured of all our Manitoba *Peromyscus*. The colour of many adults of this sandhill form match that of sand so closely that they are hard to see when either lying still or running about over it. Their colour is almost identical with that of *P. m. luteus* of Nebraska, which lives in a similar habitat.

When examining specimens from the Riding and Duck Mountains we see that they are much darker on the back and hind quarters and slightly smaller than the sandhill mice. They appear to be more closely related to *P. m. borealis* in colour than either *bairdii* or *osgoodi*. In fact they have developed a colour pattern which is more in harmony with their darker surroundings.

Between Lake Manitoba and Lake Winnipeg, are endless intergrades which do not show any close relationship with either typical *P. m. bairdii, borealis,* or *maniculatus*. A very good example of this is seen in two mice in Mr. Soper's very fine collection. They are a clear soft grey, strikingly different to any other forms I have seen. Towards the south end of Lake Winnipeg and east of the Red river the mice show unmistakable signs of close relationship with the western form *P. m. maniculatus*, which occurs abundantly in the coniferous forests some sixty miles east of Winnipeg.

Record of abundance, age and sex

The original object of this part of the study was to try and determine the magnitude of the population fluctuations which were known to take place among our small mammals by keeping day to day records of all those killed on the farm, or examined in hand. This aim was soon enlarged to include relative age, sex and when possible, pregnancy. Rare species and uncommon specimens were noted and made into study skins. While the results from this work are gratifying, they are not as dependable as I should wish, as too many unforeseen conditions crept into them. For instance, some autumns were fine and warm, while others were the reverse, cold and damp. Thus in one season harvesting would be over before the mice had time to congregate in the grain stooks, while in the other they had ample time to do so. This would result in far more being killed and recorded in the one season than in the other. Such uncontrollable conditions as these do not apply to other seasons of the year, so perhaps a truer indication of the yearly population can be found in them.

During the first twenty years of this study, 1928-1947, 22,173 mammals were recorded, among which were 6,012 white-footed mice. The tables below, (1), gives the total number of these examined for each year of the study and the relative age and sex in the following order: adult male, juvenile male, adult female and juvenile female. Table 2 gives the month in which the greatest numbers were recorded for the year. It helps the impression implied in table 1, that there are years of abnormal abundance followed by others of relative scarcity. However neither show that a smooth rhythm took place during the twenty years of the study.

The reason for more adult males, (292), being captured than adult females is partly explained by the greater activity of the males during the breeding season, which exposes them to danger more often than the quieter females. This cannot be applied to the juveniles and as there were 114 more males recorded than females, we must conclude that more males are born than females.

Measurements

The data given in the following table (No. 3), comprise measurements of mice from various localities in Manitoba. Although not very comprehensive or informative, they do show that size and length of tail vary considerably in different localities. The figures for the sandhills are the means of twenty typical adult males and twenty selected adult females. As insufficient adult specimens were procured from the other districts to obtain a significant average a typical male from each locality has been chosen as a representative.

The measurements are in millimetres, and indicate total length, tail vertebrae, right hind foot. Weights are in grams.

Breeding

The date on which the breeding season starts in the spring and terminates in the fall depends very largely on the conditions of the weather at those seasons of the year,

Table 1. RECORD OF YEARLY TAKE

Year	adult ♂	juvenile ♂	adult ♀	juvenile ♀	Total
1928	108	99	76	89	372
1929	83	81	69	71	304
1930	61	26	34	19	140
1931	121	31	69	30	251
1932	51	22	51	16	140
1933	101	33	88	30	252
1934	64	28	49	19	160
1935	152	119	108	104	483
1936	140	115	105	128	488
1937	153	127	96	77	435
1938	92	75	69	59	295
1939	154	158	149	183	644
1940	77	91	88	82	338
1941	43	44	36	42	165
1942	32	48	31	46	157
1943	39	49	43	46	177
1944	87	134	78	134	433
1945	81	87	91	86	345
1946	70	99	72	83	324
1947	33	19	30	27	109
Totals	1724	1485	1432	1371	6012
Total ♂♂	3209				
Total ♀♀	2803				
Total	6012				

but on an average it commences in March and continues without marked interruption until the end of September. In early March, I have taken half grown young which must have been born in February. I also have the following records of gravid females for late November 1940 when I killed two females on the 23rd and another on the 25th whose young would not have been born until the end of the month or early in December. These mice were killed as they ran from grain stooks which were being loaded from a field well away from farm buildings.

It will be noticed in table 4 that there are fewer records for the months of June and August than there are for other months of the main breeding season. The explanation for this is due to the type of farm work being carried on at those periods. It often proves unfavourable for securing specimens and so fewer records are obtained. It is not a falling off in the birth rate at those times as might be suspected.

Table 4 shows the number of embryos carried varies from two to nine. It also shows the number of occurrences for each month, and on the right the number of females examined and the total number of embryos recorded.

Females born early in the season usually commence to breed when little more than half grown and their first litter seldom exceeds four young. This does not apply to females that were born too late to breed in the previous season as they will be full grown by spring and will then bring forth an average litter of five or six young.

Mother and young

At birth the young are chubby little mites, naked, blind, toothless and are only able to squirm about and utter faint squeaks when hungry or disturbed. They grow rapidly and are able to fend for themselves when about three weeks of age. Their mother is most attentive and takes the greatest care of

Table 2. GREATEST MONTHLY CATCH IN EACH YEAR

Year	Month	adult ♂	juvenile ♂	adult ♀	juvenile ♀	Total
1928	Sept.	22	29	22	29	102
1929	July	8	30	11	24	73
1930	Sept.	8	2	9	4	23
1931	Aug.	8	6	9	7	30
1932	Aug.	8	8	3	6	25
1933	July	13	12	12	12	49
1934	Sept.	15	10	13	7	45
1935	Sept.	33	35	30	10	108
1936	Sept.	10	33	8	35	86
1937	Sept.	25	32	10	16	83
1938	Sept.	18	24	17	21	80
1939	Sept.	87	101	79	116	383
1940	Sept.	21	42	15	34	112
1941	Oct.	14	23	16	25	78
1942	Aug.	5	16	5	18	44
1943	Sept.	6	14	4	14	38
1944	Sept.	22	61	29	58	170
1945	Aug.	17	30	24	32	103
1946	Sept.	16	40	21	30	107
1947	Sept.	10	12	10	12	44
	Totals	366	560	347	510	1783

Total ♂♂ 926
Total ♀♀ 857

Total 1783

Table 3. MEASUREMENTS OF MICE FROM VARIOUS LOCALITIES IN MANITOBA

Localities	Sex	T. L.	T. V.	H. F.	Wt.
Sandhills	♂	160.2	65.0	19.5	22.9
Sandhills	♀	160.8	65.0	18.8	22.6
Melita	♂	168.0	70.0	19.0	—
Tigerhills	♂	172.0	73.1	20.7	—
Kenton	♂	164.0	62.0	18.0	—
Riding Mts	♂	155.0	65.0	19.5	—
Duck Mts	♂	165.0	67.0	20.0	21.9
Delta, L. M.	♂	169.0	72.0	18.5	—
Beaver Dam Lake	♂	157.0	68.0	18.0	—
Leffura	♂	162.0	65.0	19.0	—
Dog Lake	♂	165.0	78.0	20.0	13.9
Elm Point	♂	171.0	78.0	20.0	18.5

Table 4. NUMBER OF EMBRYOS CARRIED BY GRAVID FEMALES

No. of embryos per ♀	2	3	4	5	6	7	8	9	No. ♀♀ examined	Total No. embryos
March	0	0	2	1	2	0	0	0	5	25
April	0	0	0	10	5	2	2	0	19	110
May	1	2	5	9	5	3	1	0	26	132
June	0	0	3	3	6	4	1	0	17	99
July	0	0	1	13	5	1	1	1	22	123
August	0	1	3	6	5	3	0	0	18	96
September	1	0	4	12	13	5	0	1	36	200
October	0	0	3	3	1	0	0	0	7	33
November	0	0	0	3	1	0	0	0	4	21
Total	2	3	21	60	43	18	5	2	154	839

them, even to endangering her life for them. This is illustrated by the following observation. One evening, after retiring for the night in an old log shack I heard the faint squeaks of young mice coming from beneath the straw upon which I was lying. Soon afterwards I noticed their mother watching me from a safe distance. Upon my remaining perfectly still, she cautiously approached, went quickly beneath the straw and as quickly returned with a young one held firmly in her mouth. She ran up the wall, along the top log to the far corner and shoved the youngster into a large crack. She then returned for another and in quick succession removed five from close beneath me. They were not placed together, but hidden away in different crannies some feet apart, all well up from the floor. After placing the last one in safety, she ran off and was away for several minutes, evidently looking for a comfortable place for her family, for on returning she ran to one of the youngsters, took it in her mouth and scampered out of the building. The others were carried off in a similar manner and all were safely removed to their new home within a few minutes.

When working in the fields at harvest time we often find nests of young mice and occasionally an adult will dash away with her family hanging to her teats. This only occurs when the young are being suckled and their mother has to take instant flight. It is not an effort on her part to save her family, but merely the instinct of the young to hang on while feeding.

Nests

More often than not these mice have a wide choice of places in which to make their nests and they usually select the one which is most suitable to their requirements. I have found nests in holes of ground squirrels, pocket gophers and badgers, in hollow logs and standing trees, and beneath decaying roots, bits of board and other matter lying on the ground. I have also found them in farm buildings, grain stacks and stooks, in *Pedomys minor* homes and even in birds' nests. While this is by no means a complete list of nesting places it will give some idea of where they may be found.

The nest is usually round with the entrance just above the bed. Normally it is from four to five inches across, the size depending on the number of mice using it and the length of time it has been occupied. I have found nests that have been in use for many years and added to from time to time until they had become bulky affairs nearly a foot across. One such nest as this had enough waste material about it, discarded from nest and store, to more than fill a bushel basket.

When made under natural conditions those materials which provide the greatest comfort and warmth are used. I have found nests either made of, or lined with, the following materials: cotton from poplar; willow and prairie anemone; down of thistle, milkweed, dandelion and other air-borne seeds; animal hair and wool; feathers; finely shredded grass and moss. Grass and moss nests are usually lined with one or other

of the finer materials. A most unusual nest found on the edge of a swamp had an outer covering of moss which was thickly lined with mouse hair secured from a nearby weasel nest. When living in country houses and farm buildings the mice usually have a wide variety of fine materials to chose from and their nests will generally contain samples from them all.

Food and Stores

The food of the white-footed mouse varies quite perceptably during the changing seasons of the year. During the colder months, that is, late fall, winter and early spring, the mice feed almost exclusively on vegetable matter obtained from a great variety of seeds gathered and stored close about the nest in the autumn. Seeds are also largely eaten as the various types ripen in succession throughout the summer.

During the warmer months of the year the mice turn largely to insects for their source of food. In early summer I have often seen where cutworms have been unearthed in growing grain crops. In June large numbers of June beetles are consumed, and later on grasshoppers and their eggs are taken extensively and eaten in large numbers until freeze up. Insects become most important during the hot dry weeks which we occasionally have in July and August. They not only provide the mice with rich food, but also with a copious supply of moisture which is so necessary at such times and cannot be obtained from any other source. Beside seeds and insects many kinds of wild fruits are eaten, also a small amount of succulent vegetable matter and the flesh of their own kin and other animals when found freshly killed.

The inherent urge to gather food for future use is present at all seasons of the year, although most strongly developed in the fall when seeds in large quantities must be gathered and stored for winter use. While at this work the mice seem to be full of tireless energy. They travel long distances for choice seeds, carry fully loaded cheeks back to their stores, improve their nests, and attend to many other matters important to their winter existence. This work continues without interruption until winter sets in and even then work is continued on all the milder nights.

I am unable to say how far the mice will go for food. On one occasion I followed their tracks along a sandy trail to some spilt grain 366 yards away from their home. I have known them to go nearly this distance on several occasions for choice grains. Usually several spend the winter where I am able to watch their movements from tracks left on the snow. A few years ago two had their home in an old well that I passed daily. They were out nearly every night, once even when it was calm and 37° below zero. They usually went to some cherry bushes, 238 yards away, occasionally 312 yards to a granary and at short intervals to outlying holes or weed patches.

The amounts of the various kinds of seeds found in the stores listed below are given in percentages and the size by total weight.

No. 1. On wheat stubble field: wheat 63.5, wild buckwheat 21.3; green foxtail 9.8, other seeds 5.4. Wt. 1 lb. 7 oz.

No. 2. From rye field: rye 36.5, wild buckwheat 31.3, green foxtail 23.2, lamb's quarter, dragon's head, and false flax 9.0. Wt. 1 lb. 3 oz.

No. 3. On sweet clover field, between wheat and oats: wheat 29.7, sweet clover 26.4, oats 17.2, wild buckwheat 16.7, brome grass seed 5.8, other seeds 4.2. Wt. 1 lb. 11 oz.

No. 4. In straw stack against granary filled with wheat and oats, in use for several years: wheat 71.0, wild buckwheat 18.0, oats 8.0, false ragweed, thistle and primrose 3.0. Wt. 45 lbs.

No. 5. In old drill grain box, 127 yards from granary: wheat 49.2, sweet clover 21.3, wild buckwheat 11.7, cherry stones 6.0, acorns 3.6, rye 2.8, green foxtail 1.8, brome and rye grass seeds 0.6, dragon's head, sunflower, knot weed, rose, lamb's quarter 0.4. Wt. 9 lbs. 11 oz.

No. 6. From pasture field: knot weed, two kinds, 45.7, cherry stones 17.7, poverty weed 2.3, brome, rye and other grass seeds 9.5, wild buckwheat 7.6, rose 3.6, green foxtail 2.7, other seeds 1.1. Wt. 1 lb. 2 oz.

No. 7. In old building among cherry bushes: cherry stones 1 lb. 5 oz., russian pigweed 1 oz. Wt. 1 lb. 6 oz. There were well over 13,500 cherry stones in the store and a nest of torn-up paper over the store.

No. 8. Store of female about to have young, found October 4th in oak grove, had had 652 acorns in four shallow chambers close about her nest.

The stores tabulated above will give a general idea of what is eaten during the winter. They also show, by the variety of seeds found in them, that the mice prefer a mixed diet when it can be had. A few stores found on the prairie, and dug out by badgers, had contained a large assortment of seeds. Those most noticeable were: wild sunflower, allium, vetches, anemone, cherry, rose and several kinds of grasses and sedges. No stores have been found in the sandhills, although I have often seen where mice had been gathering seeds in the fall, of spruce, sunflower, cherry, and oak, as well as those of the sand-binding grasses *Oryzopsis, Andropogon* and *Calamovilfa* and from the sedge *Cyperus Schweinitzii,* which grows profusely in some parts of the area. Besides these, seeds are gathered in small amounts from many other sources.

In all the stores so far examined I have never found a trace of bulbs, tubers, rootstalks, green herbage or insects. Food is usually eaten close about the nest or in the store room, which is also largely used as a latrine.

Playing

Like most of our small mammals, white-footed mice indulge in games of one kind or another and seem to take great pleasure in them. Their games may take the form of chasing one another, or carrying some small object, hiding or throwing it about. One which we kept for several months, soon became friendly and unafraid of us. One evening we noticed him dashing about his cage with a wad of cotton in his mouth, evidently having a game with it. This led to giving him other objects to play with. Feathers seemed to afford him the greatest pleasure and provided us with much amusement. A large stiff feather poked through the wire netting of his cage and pulled back and forth with a quick jerking motion by our children provided them and the mouse much sport. He would jump up and down on the feather, try to hold it with his forefeet and teeth, jump away from it, turn and spring back and worry it as though it was some living monster. These games often continued intermittently for half an hour or more, the children laughing and kicking up no end of a noise and the mouse apparently enjoying the game as much as they.

Fighting

Fighting often takes place between males and is usually well worth watching. Their movements in jumping at and avoiding one another, are done so quickly that they are hard to follow. They seldom jump directly at each other, "like domestic cocks," but rather take turns at doing so. The one starting the fight will suddenly make several successive jumps at the other, endeavouring to kick him from above, on the head and back. If possible this is skillfully avoided and in quick succession the attacked becomes the attacker, and so the fight continues until one or other manages to land a few solid blows which usually end the fight.

If a fight takes place in a small cage at night, the mouse getting the upper hand will quickly kill the other by jumping up and down on him and will probably have most of him eaten by next morning, always consuming his brain first. In all the fights I have witnessed between these mice I have never seen them attempt to bite one another and have very seldom taken one with torn ears or scarred faces. A few have had damaged tails, but whether this was done by their own kin or some other species I do not know.

Travel or Migration

My efforts to secure information on this subject by following tracks across the snow in early spring have met with little success. In a few instances I have seen where individuals have travelled considerable distances in a given direction, but never anything suggesting that several had moved away in company. My records give one account of my following the tracks of one for nearly a mile, and while the mouse wandered about a good deal, he kept going in the same general direction. He was caught hiding under some loose straw, examined and given his freedom. Other records tell of mice travelling well over half a mile in a similar manner. Each had hidden beneath the snow for the day. Whether the mice continued their journey next evening, or returned to their starting point, I cannot say.

We have demonstrated through trapping that a great deal of local movement takes place during spring and summer. Most of this is brought about by three main causes: (1) the departure of many adults from their winter quarters in early spring, (2) sexual

activities during the breeding season and (3) young leaving their natal nest to find homes of their own. While some of these mice, and those mentioned above, evidently travelled considerable distances, their movements can never be considered anything but individual travel or personal migration.

Survival and Predation

The active life led by white-footed mice, their preference for sand-blown, cut banks and sparsely covered prairies, along with their love for following game paths and open roads in summer and running across the snow in winter, exposes them to capture by predaceous animals more readily than any other race of mice. These life habits which might be considered adverse, would have exterminated the species long before this if it were not for their cleverness and great fecundity. These two latter factors alone have not only enabled them to survive, but have enabled them to maintain a greater, and more nearly balanced population through the years than any other species of North American mice.

Weasels and owls are by far the most important of all the predaceous animals which prey upon, and so control, the populations of the white-footed mouse. They are ably supported in this work by the coyote, badger, ground squirrels, skunk and fox, all of which are keenly awake for the mouse, whose flesh is apparently superior in flavour to that of most rodents. As these mice restrict their activities to the hours of darkness, hawks can have little effect on their numbers. Crows are more important as many mice exposed by farm work fall prey to them.

During my long acquaintance with these mice I have seldom found one that appeared to be suffering from disease, and have no evidence to show that they have, at any time, been swept off by a disease similar to those which periodically reduce the populations of other species from great abundance to relative scarcity.

Like many of our small rodents, white-footed mice become infested with the larvae of the botfly, *Cuterebra grisea*, Coq. One captured in July had five great bots embedded beneath his skin. He was very thin and listless when caught and would probably have died before the last bot fell from his body. External parasites are occasionally found, but they are seldom in sufficient numbers to harm the mice.

Economic Importance

In reference to agriculture and sylviculture alone the economic importance of the white-footed mice would not be too black, as the amount of damage done by them on grain fields and in the forests is usually offset by the numbers of harmful insects and weed seeds eaten by them. But when they invade country homes and farm buildings they become extremely destructive, and are capable of doing a vast amount of damage in a short space of time. This alone condemns them as vermin and as such they must be destroyed without compunction.

A STUDY OF SCREECH OWLS IN SOUTHERN ONTARIO[1]

R. F. JAMES *and* N. D. MARTIN

INTRODUCTION

IN 1935, R. F. James began putting up roosting barrels for screech owls *(Otus asio naevius)* in southern Ontario. Since 1940, N. D. Martin has assisted in this study. Over a thousand barrels have been placed since 1935. Screech owls discovered within the barrels have been used for banding and for breeding experiments. Information on food of screech owls have been derived from examination of barrel contents.

Received for publication March 6, 1950.

MANUFACTURE OF OWL BARRELS

A nail keg with top and bottom in place is used. A round, oval, or rectangular hole four inches in diameter is cut in the side, near the top. The keg is then coated with a coat of creosote to withstand rain, snow, and hot sun. Dark green, brown, black, or aluminum paints contribute most to the camouflage of the barrel. The edge of the

entrance is then smoothed with a file; this leaves a white ring around it, accentuating it and giving it a well-worn appearance that may attract screech owls. An identifying number and the following notice are stencilled on the side of the barrel:

UNDER ORNITHOLOGICAL OBSERVATION
BY REG. F. JAMES, WILLOWDALE, ONT.
PLEASE DO NOT MOLEST.

This barrel is nailed up in a vertical position in a tree. Modifications of this vertical type of barrel include the observation barrel, the horizontal barrel, and the trap barrel.

The observation barrel resembles the vertical barrel, but has in addition a removable panel four inches square in the side. The lower edge of the panel is close to the bottom of the barrel, so that when the panel is removed, barrel contents may be observed or photographed.

The horizontal barrel does not have any opening in the side. Instead, about one third of the top is left open. This opening provides the entrance when the barrel is nailed in a horizontal position in a tree. The horizontal barrel was originally intended to attract wood ducks around ponds and streams, but the screech owl has proved its most common occupant.

The trap barrel is a vertical barrel fitted with a trap door. The door is weighted, and swings inward and upward. It is propped open by a piece of wire extending from the floor of the barrel to the trap door. An animal that enters the barrel knocks the wire aside and the door falls across the entrance. The trap barrel must be checked daily to determine whether or not an animal has been entrapped.

The authors are now testing a "barrel" of a more permanent nature. This is a heavy steel box about one foot cube. It has a three-inch opening in one side near the top, and is nailed to a tree with two six-inch nails driven through holes conveniently located in the back. These odd "bird-houses" were originally used to transport certain metal parts by a hardware firm. So far only ten of these boxes have been placed up for animals; these ten are used each year by tree swallows *(Iridoprocne bicolor)* and house wrens *(Troglodytes aedon)*.

Vertical and horizontal barrels are shown in Fig. 1.

PLACEMENT OF BARRELS

Barrels most often used by screech owls are those placed at the edge of a woodlot, marsh, or garbage dump, beside a stream, or in a wooded valley surrounded by open fields. Barrels placed at a height of 15 feet are most often used. The most suitable trees are deciduous trees, tamarack, white pine, and hemlock. Barrels are fastened to the trees with two four-inch nails driven one through the top and one through the bottom metal rim. A handful of sawdust is placed inside. Selection of sites is made to avoid discovery by children.

Owl barrels have been placed between London on the west and Oshawa on the east, Toronto on the south and Chalk River on the north. Ninety per cent are in York County.

USE OF BARRELS BY OWLS

Screech owls use the barrels as roosting cavities — especially in winter — and as roosting sites in spring. When discovered within, they can be captured. Barrels have been checked on an average of one day per week since the inception of this study. Since only about 25 barrels may be checked in a day, some barrels may not be checked more often than once a year.

Examination of the barrel contents usually reveals what animals have been there, how frequently and how recently they have been there. A screech owl leaves pellets, droppings, feathers of prey, and the occasional feather of its own. If a barrel contains only one or two pellets, it has been used on a few days only. If it is covered with droppings, and contains dozens of pellets in all stages of decomposition, it has been used by one or more screech owls for a whole season or many seasons.

FOOD OF SCREECH OWLS

The following is a list of animals found dead in the barrels, entire or partly eaten by screech owls. In many cases, an owl has been found roosting with its uneaten prey.

MAMMALS

white-footed mouse *(Peromyscus)*
meadow mouse *(Microtus pennsylvanicus)*
rabbit (skull only, unidentified)
rat *(Rattus norvegicus)*, decapitated carcass

Fig. 1. Vertical (left) and horizontal barrels ready for placement.

BIRDS

Decapitated carcass of
flicker *(Colaptes auratus)*
meadowlark *(Sturnella magna)*
Feathers of
blue jay *(Cyanocitta cristata)*
black-capped chickadee *(Parus atricapillus)*
catbird *(Dumetella carolinensis)*
robin *(Turdus migratorius)*
English sparrow *(Passer domesticus)*
cardinal *(Richmondena cardinalis)*
redpoll *(Acanthis flammea)*
goldfinch *(Spinus tristis)*
slate-coloured junco *(Junco hyemalis)*
tree sparrow *(Spizella arborea)*
white-crowned sparrow *(Zonotrichia leucophrys)*
song sparrow *(Melospiza melodia)*

OTHER FOOD

fish (mostly Cyprinidae)
crayfish (broken remains)

Decapitated mice were frequently found in barrels. This suggests that the screech owl often eats the head of its victim first, and leaves the remainder for a future occasion. The head of the victim may be the preferred part of the screech owl's meal.

When the snow is deep, screech owls are most often found in barrels located near open water patches of streams. These barrels then contain remains of fish left by owls. Fish are mostly about three inches long. Common suckers *(Catostomus commersonnii)* seven inches long were found on two occasions.

BARREL OCCUPANTS OTHER THAN SCREECH OWLS

Gray and red squirrels *(Sciurus carolinensis* and *Tamiasciurus hudsonicus,* respectively) use the barrels almost as much as does the screech owl. As many as six young white-footed mice *(Peromyscus)* have been found at one time in barrel nests. Sparrow hawks *(Falco sparverius)* nest in barrels that are placed in open country. One barrel contained a sparrow hawk's nest four years in succession, and one of the adults used the barrel all winter for three winters. Crested flycatchers *(Myiarchus crinitus)* and starlings *(Sturnus vulgaris)* have nested in them. The raccoon *(Procyon lotor)* has been found during the day in barrels, almost completely filling them. The flicker *(Colaptes auratus)* roosts and nests in them.

Less frequent occupants have included the flying squirrel *(Glaucomys sabrinus),* weasel (unidentified), house wren *(Troglodytes aëdon),* and unidentified bees and wasps. Honey bees converted six barrels into hives, and overwintered in them. One barrel was found in October packed with butternuts. Another contained corn cobs. These were probably squirrels' storehouses.

On two occasions a saw-whet owl *(Cryptoglaux acadica)* has been discovered roosting on a branch beside a barrel, but never within.

SUMMARY

1. Over a thousand nail kegs were converted into roosting houses for screech owls and

placed in trees throughout southern Ontario.

2. Prey carried by screech owls into the barrels included four species of mammals, 14 species of birds, fish averaging three inches long, and crayfish.
3. Owl barrels have been used as nesting or roosting quarters by five other species of birds and six species of mammals. Bees and wasps have nested in them.

ACKNOWLEDGMENTS

The original trap barrel was designed and constructed by A. W. Ghent. C. E. Hope identified many of the feathers of screech owl victims. J. L. Baillie read the manuscript critically.

SOME MYXOMYCETES OF CANADA [1]

ELI DAVIS *and* W. D. SUTTON
London, Ontario.

DURING THE LAST FIFTEEN YEARS the authors of this paper have been collecting and studying specimens of the myxomycetes or mycetozoa. The collecting has been done chiefly in the County of Middlesex in southwestern Ontario, but some has been done in other parts of the Province, in Quebec, in Tennessee, Kentucky, New Hampshire, Connecticut, Florida, and New Mexico.

In the course of this pleasant pastime we collected in Ontario and Quebec a number of species and varieties that had, at the time of collection, not been previously reported in Canada. Specimens of many of these species and varieties were sent to Robert Hagelstein and these specimens were afterwards used by him in recording their Canadian distribution. In addition, a few species have been collected that have not been previously encountered in this country. It is the purpose of the present paper to record our collections in order to add to the knowledge of the occurrence and distribution of the Myxomycetes in Canada.

Currie (1920) has summarized most of the Canadian records of Myxomycetes, published up to the time of her writing. Apparently she had not seen the Dearness list (1911) which records the names of 51 species collected in Middlesex County, Ontario. Also she does not mention the list of 30 Canadian gatherings, unpublished at the time, which Miss Lister gave to W. A. Cheesman and which he included in the first part of his paper (1911). Since Currie's paper appeared Adamstone (1922) listed 28 species and one variety which he collected in the Lake Nipigon district of Ontario; Bisby, Buller, and Dearness (1929) recorded 73 species and six varieties from Manitoba; later, Bisby (1938) listed 91 species and 8 varieties from Manitoba and Saskatchewan; and Mains, Overholts, and Pomerleau (1939) published a list of 113 species and 9 varieties collected in Quebec in 1938 during the Summer Foray of the Mycological Society of America. A count of all forms recorded for Canada including those in the present paper shows that 200 species and 32 varieties in 41 genera have been found in Canada.

In the 40 years since Moore's list (1910) was published, numerous changes have been made in the nomenclature, and in the delimitation of genera, species, and varieties, of the Myxomycetes. There are still several points in these matters on which authorities do not agree. With certain exceptions and reservations we have followed in this paper the arrangement and nomenclature given in "The Mycetozoa of North America" by Robert Hagelstein (1944).

In the private herbaria of the authors there are more than 2500 collections of the Myxomycetes, representing 228 species and 29 varieties in 44 genera. Of the 41 genera, 200 species, and 32 varieties so far recorded from Canada, these herbaria contain representative forms of 40 genera, 192 species, and 22 varieties. Not all of these, of course, are from Canada. Some are from the United States, the West Indies, and Europe. A considerable amount of duplicate material is available for exchange and distribution. Numerous specimens have been communicated to The New York Botanical Garden, The University of Western Ontario, The University of Toronto, The State University of Iowa, Willamette University, The University of Florida, The University of Montreal, The University of Tokyo, and to several private herbaria.

[1] Received for publication April 8, 1950.

The authors wish to acknowledge gratefully their indebtedness to the late Robert Hagelstein who assisted them kindly and freely by determining specimens, checking determinations, and generously supplying excellent authentic material for their herbaria. To Dr. John Dearness who inspired and aided them in their studies, and to Dr. G. W. Martin who has willingly assisted them with determinations and advice, they are indeed thankful.

Unless it is stated otherwise, collections of the Myxomycetes recorded in this list were made by one or both of the authors, and all moist chamber developments were secured by Eli Davis.

Catalogue of Species

1. *Arcyria carnea* G. Lister

Collected for the first time in Canada near Duchesnay, Quebec, in 1938. Since then, found at least once in Ontario. These are the only records for Canada.

2. *Arcyria insignis* Kalchbr. & Cooke

Collected in both Ontario and Quebec. Previously recorded from Manitoba by Bisby (1929).

3. *Badhamia affinis* Rost

Quebec, 1938. Ontario, 1945.

4. *Badhamia affinis* Rost. var. *orbiculata* (Rex) G. Lister

Ontario, 1935. Quebec, 1938. Previously unreported from Canada.

5. *Badhamia gracilis* Macbr.

In January, 1938, Eli Davis toured the southern part of the United States. He brought home a piece of Yucca wood from New Mexico to make fire-by-friction sets. Finding the wood was damp and unworkable, he tried to dry it beside the furnace in the basement of his home. When this method failed he threw the wood out into the backyard. There it remained until May, 1941, when a good fruiting of *Badhamia gracilis* appeared on it. This species may prefer, or require, this particular substratum on which to fruit, but it apparently found the Canadian climate not unfavourable. Macbride and Martin (1934) state that most of their material of this species is on Yucca or Cactus.

6. *Badhamia lilacina* (Fries) Rost.

Previously recorded from Ontario, it was collected in Quebec in 1938.

7. *Badhamia macrocarpa* (Ces.) Rost.

Recorded by Bisby (1929) from Manitoba. Collected three times in Ontario.

8. *Badhamia ovispora* Racib.

This species (on dung from Germany and Saskatchewan) was developed in the laboratory at Toronto, Ontario, in 1935 and 1936, by Dr. Roy F. Cain. We have collected it several times in greenhouses at Byron, Ontario, where the moist mulch of straw and manure and the high temperature approximated the conditions of a moist chamber on a large scale.

9. *Badhamia rubiginosa* (Chev.) Rost.

Previously recorded from Ontario by Currie (1920). Collected in Quebec, 1938.

10. *Brefeldia maxima* (Fries) Rost.

Recorded from Ontario by Faull (1913), and by Currie (1920), and reported from British Columbia by Macbride and Martin (1934). Collected in Quebec by René Pomerleau and communicated to Eli Davis.

11. *Clastoderma Debaryanum* Blytt

The first Canadian collection was made in 1939 at Komoka, Ontario, on dead trunks of a species of Cornus. Collected several times since on the same substratum.

12. *Comatricha aequalis* Peck

Currie listed this species from Ontario as *C. nigra* Schroeter var. *aequalis* (Pk.) Sturgis. We have collected it in both Ontario and Quebec.

13. *Comatricha cornea* G. Lister & Cran

Developed in moist chamber on bark of *Juglans cinerea* in January, 1941.

14. *Comatricha elegans* (Racib.) Lister

This species was listed by Currie (1920), but the material was collected in New York State. Lister (1925) records it from New Brunswick and Quebec. We have collected typical specimens several times in Ontario.

15. *Comatricha fimbriata* G. Lister & Cran

Obtained at Byron, Ontario, in moist chamber developments on wood from New York State.

16. *Comatricha laxa* Rost.

One collection has been made on a pile of firewood in Springbank Park, Byron, Ontario. Apparently this is the only Canadian collection.

17. *Comatricha longa* Peck

Lister (1925) records this species from Ottawa, Ontario. We have collected it three times in southwestern Ontario. These are the only Canadian records.

18. *Comatricha pulchella* (Bab.) Rost. var. *fusca* Lister

One collection from Kettle Point, Ontario. This appears to be the only collection made in Canada.

19. *Comatricha rubens* Lister

This species was collected in Laurentides National Park, Quebec, by Hagelstein and Rispaud. We have collected one rather doubtful specimen at Komoka, Ontario, in 1940.

20. *Comatricha subcaespitosa* Peck

Previously recorded from Nova Scotia by Macbride and Martin (1934). Collected three times in Ontario.

21. *Comatricha tenerrima* (Curt.) G. Lister

We collected one specimen in October, 1937, at Komoka, Ontario. Hagelstein (1939) reported the species from Quebec.

22. *Craterium aureum* (Schum.) Rost.

Collected at Duchesnay, Quebec, in 1938, and at Byron, Ontario, in 1939. Several other collections in Ontario. Apparently the only records for Canada. Hagelstein (1944) says it is not uncommon throughout North America but does not specify any part of Canada where it has been found.

23. *Cribraria minutissima* Schw.

We have collected this tiny species several times in Ontario. Due to its minute size it is difficult to find. This is the first record of its discovery in Canada.

24. *Cribraria piriformis* Schrad.

This species has been collected by the authors at least once in Ontario. Hagelstein (1944) lists Ontario for this, but a search of the herbarium at The New York Botanical Garden has failed to reveal any specimens from here. The specimen we collected is fairly typical. Hagelstein (1944) states that representative forms are rare and confined to those from mountainous regions. Wehmeyer (1935) records it from Nova Scotia.

25. *Cribraria rufa* (Roth) Rost.

Collected several times in Ontario, the earliest in 1937. Hagelstein (1944) lists it from Prince Edward Island, by report.

26. *Cribraria violacea* Rex

Collected in Ontario several times. Developed once in moist chamber. Not reported from any other part of Canada.

27. *Diachea caespitosa* (Sturg.) A. & G. Lister

Collected in 1940 at Byron, Ontario, on the tips of sphagnum. The first record for Canada.

28. *Diachea leucopodia* (Bull.) Rost.

Quebec, 1938. Strange to say, this cosmopolitan species had previously been reported only from Ontario.

29. *Diachea subsessilis* Peck

Collected at Dorchester, Ontario, in 1940. Hagelstein (1940) records it from Algonquin Park, Ontario, collected by R. F. Cain in 1939, and (1941) from Quebec. These appear to be the only records of this species in Canada.

30. *Dianema corticatum* Lister

Previously reported from Alberta and Quebec by Lister (1925). Found several times in Ontario.

31. *Dianema Harveyi* Rex

This exceedingly rare species has been previously recorded in North America from three widely separated stations—Maine, 1889, Colorado, 1913, and Manitoba, 1938. We have made several collections in Ontario, the earliest in 1939.

32. *Diderma Chondrioderma* (de Bary & Rost.) G. Lister

Bisby reported this species from Manitoba with the comment, "apparently this species". We have two moist chamber developments on bark of *Juglans*.

33. *Diderma montanum* Meylan

Found at Komoka, Ontario. Several collections, the first in Canada.

34. *Diderma montanum* Meylan var. *album* (Torrend) G. Lister

Several collections from Komoka, Ontario. The only records for North America.

35. *Diderma simplex* (Schroet.) Lister

Found several times at Byron, Ontario, on sphagnum. The only Canadian records.

36. *Didymium anellus* Morg.

Bisby (1938) reported that this species had been developed in moist chamber in Manitoba. Collected in Ontario at least once.

37. *Didymium clavus* (Alb. & Schw.) Rabenh.

Previously recorded from Alberta by Cheesman (1911). We have found it in Quebec and Ontario.

38. *Didymium difforme* (Pers.) Duby

Previously recorded from British Columbia, and from Manitoba, a moist chamber development. We have collected it in Ontario.

39. *Didymium ochroideum* G. Lister

Collected several times on the moist mulch in a greenhouse at Byron, Ontario — the only Canadian collections.

40. *Didymium Sturgisii* Hagelstein

Developed in moist chamber at Byron, Ontario.

41. *Didymium xanthopus* (Ditm.) Fries

Reported by Bisby (1938) as developed in moist chamber in Manitoba. We have collected it in Ontario several times. Wehmeyer (1935) records it from Nova Scotia.

42. *Echinostelium minutum* de Bary

Developed in moist chamber at Byron, Ontario, in 1940.

43. *Elaeomyxa miyazakiensis* (Emoto) Hagelstein

The first North American collection, the second in the world, was made by Eli Davis in 1938 at Komoka, Ontario. Subsequent collections were made by us at Acton, Ontario, in 1939, and again at Komoka in 1941. These were reported by Dr. John Dearness (1940). The original collection of this species was made by Yoshikadzu Emoto (1935) in Japan.

44. *Enerthenema papillatum* (Pers.) Rost.

Collected several times in Ontario. Hagelstein (1944) lists Canada and U.S. for the distribution of this species, but we have found only one other record of its occurrence in Canada, by Wehmeyer (1935) in Nova Scotia.

45. *Fuligo septica* (L.) Weber var. *candida* (Pers.) R. E. Fries

Collected at Glanworth, Ontario. Recorded also from Manitoba and Quebec.

46. *Fuligo septica* (L.) Weber var. *rufa* (Pers.) R.E. Fries

Collected at Komoka, Ontario. Recorded also from Manitoba and Quebec.

47. *Hemitrichia intorta* Lister

Extremely rare. Collected several times in Middlesex County, Ontario. Macbride and Martin (1934) list it from Ontario. Reported from no other province.

48. *Lachnobolus congestus* (Somm.) Lister

A very rare species. Macbride and Martin (1934) list Ontario for this species, and we have collected it here several times. Hagelstein (1944) reports it from only five states of the U.S.A.

49. *Lamproderma atrosporum* Meylan

Collected by J. W. Groves at Burnet, Quebec, and determined by Eli Davis. Apparently the only collection from Canada.

50. *Lepidoderma tigrinum* (Schrad.) Rost.

Macbride and Martin (1934) report this species from British Columbia. We have found it once in Ontario, at Dorchester — a fine, large fruiting.

51. *Licea minima* Fries

Collected several times in Ontario. Mains (1939) reports it from Quebec.

52. *Licea tenera* Jahn

Developed in moist chamber in Toronto, as reported by Hagelstein (1939), and at Byron, Ontario.

53. *Macbrideola scintillans* Gilb.

Developed in moist chamber at Byron, Ontario, on bark of *Juglans cinerea.*

54. *Margarita metallica* (Berk.) Lister

This species appeared in Moore's list (1910) as *Margarita pictoviana* sp. nov. Hagelstein (1944) states that it was found repeatedly in Quebec, near Lake St. John, in August 1938. The only Ontario record is a moist chamber development at Byron, Ontario, on bark of *Juglans.*

55. *Orcadella parasitica* (Zukal) Hagelstein

Moist chamber developments at Byron, Ontario, on bark of *Celtis, Juglans, Platanus,* and *Ulmus.* Hagelstein (1942 b) proposed to broaden the genus *Orcadella* Wingate to include the genera *Hymenobolina* Zukal and *Kleistobolus* Lippert. He carried out this proposal in the Mycetozoa of North America. Martin (1942) has proposed the emendation of the genus *Licea* Schrader to include the genera *Hymenobolina* Zukal, *Kleistobolus* Lippert, and *Orcadella* Wingate.

56. *Orcadella pusilla* (Lipp.) Hagelstein

Collected at Komoka, Ontario, in 1940. Also developed on bark in moist chamber, 1941.

57. *Physarum aeneum* (Lister) R. E. Fries

Moist chamber development on bark at Byron, Ontario, in 1940.

58. *Physarum bogoriense* Racib.

Collected at Dorchester, Ontario, in 1940. Mains (1939) lists it from Quebec. First Canadian records.

59. *Physarum citrinellum* Peck

Collected at Duchesnay, Quebec, in 1938. So far reported from no other part of Canada.

60. *Physarum confertum* Macbr.

Collected in the Bruce Peninsula, Ontario, in 1944.

61. *Physarum didermoides* (Pers.) Rost.

Collected on the mulch in a greenhouse at Byron, Ontario, in 1939. Previously recorded from British Columbia and Manitoba.

62. *Physarum gyrosum* Rost.

Collected at Guelph, Ontario, in 1934, by J. E. Howitt and sent to G. W. Martin. We have made two collections in Ontario. Not previously recorded from Canada.

63. *Physarum lateritium* (Berk. & Rav.) Morgan

Collected at Duchesnay, Quebec, in 1938. Previous records are from Ontario and Nova Scotia.

64. *Physarum luteolum* Peck

Collected in Timagami, Ontario, September 1923, by G. D. Darker and W. R. Watson. We collected it at Byron, Ontario, in June, 1938.

65. *Physarum melleum* (Berk. & Br.) Massee

Listed from Quebec by Mains (1939). Collected by us at Ipperwash, Ontario, in

1940. The Ontario collection is a fine example of the rare form with orange stalks.

66. *Physarum nucleatum* Rex

Several collections from Byron and Komoka, Ontario. Hitherto unrecorded from Canada.

67. *Physarum oblatum* Macbr.

Collected in Ontario and Quebec. Bisby (1929) records it from Manitoba.

68. *Physarum penetrale* Rex

Collected at Duchesnay, Quebec, in 1938, and at Byron, Ontario, in 1940.

69. *Physarum pulcherrimum* Berk. & Rav.

Collected at Byron, Ontario, in July, 1938, and at Duchesnay, Quebec, in August of the same year.

70. *Physarum Serpula* Morgan

Collected at Duchesnay, Quebec, in August, 1938, and at Ipperwash, Ontario, in August 1940.

71. *Physarum superbum* Hagelstein

Collected several times in Ontario, at Komoka and Mt. Brydges. Hagelstein (1941) reported the collection at the latter station.

72. *Physarum viride* (Bull.) Pers. var. *incanum* Lister

Hagelstein (1944) states that this variety is abundantly distributed throughout North America, yet the only record for Canada is from Manitoba by Bisby (1929). We have collected it several times, at Komoka and Dorchester, Ontario, and at Duchesnay, Quebec.

73. *Stemonitis flavogenita* Jahn

Collected in Wawanosh Township, Huron County, Ontario, in August 1939. This is the second record for Canada.

74. *Stemonitis fusca* Roth. var. *flaccida* Lister

Collected at Komoka, Ontario, in October 1940. Not previously recorded for Canada.

75. *Stemonitis fusca* Roth. var. *nigrescens* (Rex) Torrend

Several collections in Ontario, at Komoka, Lobo, and Grand Bend, in August and September. Apparently these are the only Canadian records of this variety.

76. *Stemonitis hyperopta* Meylan

Collected at Komoka, Ontario, in 1938. Recorded by Bisby (1929) from Manitoba.

77. *Stemonitis splendens* Rost. var. *Webberi* (Rex) Lister

Collected at Komoka, Ontario, in 1936, and at Duchesnay, Quebec, in 1938.

78. *Trichia erecta* Rex

Collected at Duchesnay, Quebec, in 1938. Mains (1939) reports a collection by Hagelstein from the same area. As far as we can ascertain this species has not been recorded from any other part of Canada.

79. *Trichia floriformis* (Schw.) G. Lister

Collected several times in Ontario. There are no records from other parts of Canada.

80. *Trichia lutescens* Lister

A small gathering made at Mt. Brydges, Ontario, in October 1940, is the only Canadian record.

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NOTES AND OBSERVATIONS

Effect on trees of extremes of climate in southern Alberta. — The growing season in this region is characterized by a low rainfall and late spring frosts. Although much of the 10-15 in. annual precipitation is in June, this month is frequently subject to strong westerly winds which are both hot and dry, and thus involve a very great saturation deficiency. Whereas the growing season may commence early due to the scanty snow cover and cloudless spring days, the clear nights following cold fronts allow severe frosts to occur in May.

The dry winds may have spectacular effects on planted vegetation. After a day in early June, 1943, when the wind averaged 40 m. p.h. and the temperature 85° F., the foliage of a lilac bush *(Syringa)* 7 feet in height,

Fig. 1. Alberta white spruce transplants with crop of cones developed one year after planting at Suffield, Alta.

Fig. 2. Green ash in second foliage after frost-kill of May 9-10, 1946, at Medicine Hat, Alta.

planted in good soil alongside a building at Suffield, Alta., was completely withered by direct desiccation. Again, some specimens of the Alberta white spruce *(Picea glauca albertiana)* were transplanted from their mountain home at Seebe, Alta, to Suffield in June, 1945, when they were 7 feet high. By diligent watering they were carried through that summer and were able to develop buds, which began to open in May of 1946. All the lateral buds turned out to be cones instead of shoots. The terminal growth was however sufficient to support the trees, as shown by the accompanying photograph (Fig. 1), taken in 1947.

An exceptionally heavy late spring frost occurred on the night of May 9-10, 1946, when the temperature fell to a minimum of 19° F. The preceding 3 weeks had seen warm sunny weather, and all the trees of Medicine Hat, Alta. were in leaf. The frost resulted in the complete destruction of the foliage of green ash *(Fraxinus pennsylvanica)*, the choicest available shade-tree for the city. The foliage of Manitoba maple *(Acer Negundo)* was partially killed, and the leaves of the cottonwood *(Populus deltoides)* were slightly affected. The ash put forth a complete replacement of new foliage within 3 weeks, by the development of lateral buds which must evidently be normally suppressed. A photograph taken at this time (Fig. 2) shows the bizarre appearance of the trees, with the dried remnants of the frost-killed foliage still hanging on them. — A. W. A. BROWN, University of Western Ontario, London.

Recent Bird Records for the Ottawa District.

1. **American Brant.**

Branta bernicla. In the afternoon of October 8, 1949, fifteen were observed at Britannia, Ontario, by H. Brown, E. Mills and myself. They flew directly overhead in a close "V" formation. Flocks of Brant numbering from 3 to 39 were seen by local naturalists until November 11 on which date 3 were watched feeding about 100 feet offshore in Graham Bay by E. Mills, D. Curry and myself. On all occasions the birds showed little fear, and when feeding or resting on the shore they allowed close approach. This particular area of the Ottawa River is favoured by Brant during the spring migration, but there is apparently only one previous fall record.

2. **Gadwall.**

Chaulelasmus streperus. On November 4, 1949, D. Curry and I identified a drake Gadwall on Dow's Lake in a flock of Mallards, Blacks and one shoveller. The bird was later seen by E. Mills, Dr. D. B. O. Savile and many other members of the Ottawa Field-Naturalists' Club. It became quite tame, allowing approach within three feet, and many photographs were taken of it. The bird was in exceptionally fine plumage, correct to every detail. There are two previous Ottawa region records. The bird remained until November 19 when the water, which was being drained from the lake, became too low to facilitate feeding near the marsh.

3. **Hungarian Partridge.**

Perdix perdix. During the morning of August 16, 1949, at the Eastern Forestry Station, Kemptville, Ontario, I surprised a family of ten young and two adult Hungarian Partridge. The first indication I had of their presence was the sight of a half grown young, standing on a gravel road. When I approached to within ten feet of it, it flew showing a rusty tail. Another young scurried across the road in front on me and disappeared in the roadside underbrush. When I went into the ditch I flushed the whole family which landed in a nearby field, where the tall grass protected them from being

seen. After a short while the parents called the young to them in soft clucking notes. By following these notes I was able to flush them again and eliminate any doubt of their identity.

4. **Coot**

Fulica americana. A late record for this bird was one seen on the Rideau River, at the Eastern Forestry Station, Kemptville, on November 7, 1948.

5. **Iceland Gull.**

Larus leucopterus. At Dow's Lake on October 27, 1949, I saw what I took to be a small Glaucous Gull. It was later seen by Dr. D. B. O. Savile, V. Goodwill and others, all of whom were impressed by its small size. On October 30, it was observed by Mr. Earl Godfrey who identified it as an Iceland Gull, the second one recorded in this area. It remained for over a week.

6. **Short-eared Owl.**

Asio flammeus. On December 3, 1949, I was able to watch a Short-eared Owl hunting by the Rideau River within the city limits of Ottawa. It was not seen again until January 1, 1950, when a group of chickadees drew my attention to it while it perched in a small white cedar in Dow's swamp. This constitutes the first Ottawa-region winter record. It was last seen a week later in the Dominion Arboretum and Botanic Garden by Dr. D. B. O. Savile.

7. **Short-billed Marsh Wren.**

Cistothorus platensis. During the morning of July 24, 1949, I was helping Mr. C. H. Bennett band three Yellow Warblers near a swamp approximately 2 miles south of Ottawa. We both heard the song of the Short-billed Marsh Wren. Two days later I returned and spent the morning watching the birds. There were at least three singing males. Although they appeared much perturbed I found no nests or young. The area in which they were singing bordered a marsh. Its boundaries apparently were the end of the cat-tail marsh on one side and the beginning of a dry uncultivated field on the other. The birds were seen until the end of August.

8. **Wood Thrush.**

Hylocichla mustelina. Late in June, 1949, N. Wickenden reported hearing a possible Wood Thrush in a woods near Fairmont Avenue, in Ottawa. On June 30, E. Mills and I investigated and found two singing birds. On July 1, I returned and spent an hour and a half watching one of these males. At the end of this time he relieved the female at the nest for a period of seventeen minutes. The nest was saddled on the sloping limb of an elm, approximately twenty-six feet from the ground.

9. **Cowbird.**

Molothrus ater. On February 4, 1949, at 13 Aylmer Avenue, Ottawa, I saw a Cowbird at the feeding station where I had been looking for a Cardinal. The bird was almost totally black, with only a small patch of brown on the nape. It remained in this area of this feeding station until spring, making the second winter record. On December 3, 1949, I saw another male of this species by the Rideau River just outside the city limits of Ottawa.

10. **Lapland Longspur.**

Calcarius lapponicus. On September 17, 1949, a bird of this species landed close to me on the shore of Beattie Bay. It was collected by Mr. A. E. Bourguignon. At least five more birds were seen that same day. This is 22 days earlier than the former earliest date.

W. JOHN SMITH,
428 Sunnyside Ave., Ottawa, Ontario.

A Worm-eating Warbler *(Helmitheros vermivorus)* **at St. Andrews, N.B.** — A Worm-eating Warbler was observed by my wife and me on May 5, 1949, at St. Andrews, N.B. The bird was feeding quietly and silently in a small, yellow birch *(Betula lutea)* and was observed through 10 x 50 and 8 x 32 binoculars for fifteen minutes at a distance of twenty-five feet. The large bill, the olive and buff coloration, the four distinct black stripes on the head, and the slow unwarbler-like movements of the bird rendered its identity unmistakable.

As far as I can determine, this is the first record of this species in New Brunswick. The remaining Canadian records are from southern Ontario:

1. London, May 28, 1908 — ♂ collected by W. E. Saunders[1] and now in the collection of the Royal Ontario Museum of Zoology, Toronto.
2. Morgan's Pt., Port Colborne, April 29, and now in the Buffalo Museum of Science.

3. Vineland, May 4 to 10, 1944 — sight record by W. L. Putnam[3].

4. Four sight records at Toronto on file at the Royal Ontario Museum of Zoology:

Sept. 2, 1938 (F. Smith)
May 27, 1940 (B. Ritchie & R. Bremner)
May 9, 1943 (R. Sachs)

April 24, 1947 (T. Swift and D. Scovell)

I wish to thank Mr. J. L. Baillie of the Royal Ontario Museum of Zoology for providing the information concerning the Port Colborne specimen and the Toronto records. — D. M. Scott, Department of Zoology, McGill University.

[1] Saunders, W. E., 1958 Auk, Vol. 25, No. 3, p. 319.
[2] Axtel, H., 1949 Prothonotary, Vol. 15, p. 29.
[3] Putnam, W. L., 1944 Can. Field-Nat., Vol. 58, No. 5, p. 192.

Two Records of Shrimps from English Bay, B.C. — While conducting a study of the commercial shrimp fishery of English Bay, associated decapods were examined. As a result, two records have been established: one species constituting a first record and the other evidently a second record. The keys and descriptions of Rathbun (1904) and Schmitt (1921) were consulted in the identification of these species.

The new record is *Crago spinosissima* (Rathbun). This cragonid is represented by a single specimen, an ovigerous female captured on August 20, 1948 at 20 fathoms. Previously, *C. spinosissima* had been reported off the Oregon and California coasts (Rathbun 1904), with the northern limit at False Tillamook, Oregon. The present record, therefore, greatly extends the northern range of this species.

The other species, *Crago communis* (Rathbun) was reported by Potts (1912) as the host for the rhizocephalan parasite *Mycetomorpha vancouverensis*. Potts collected *C. communis* in Departure Bay, B.C. during August 1911. The entire distribution of this shrimp is from the Bering sea to San Diego, California.

An ovigerous female, 63 mm. in length was measured on February 13, 1949. Other specimens measured ranged from 59 mm. to 73 mm. *C. communis* was found at depths ranging from 15 to 60 fathoms. Next to the commercial pandalids this species appears to be the most abundant decapod crustacean from English Bay.

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T. H. BUTLER,
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The Scissor-tailed Flycatcher in New Brunswick. — On June 29, 1949, while at the headquarters of the Fundy National Park, Westmorland Co., New Brunswick, I saw a Scissor-tailed Flycatcher, *Muscivora forficata* (Gmelin). This bird was perched on a telephone wire above the beach in front of the Park Superintendent's house. Every few moments it launched itself into the air to a height of about fifty feet, apparently in search of food. Occasionally it flew down and alighted on the beach. The bird was easily identified by its characteristic tail and salmon-pink sides.

Several people including the wife and daughter of the Park Superintendent, my wife and Mr. Thomas Lothian, of the Biology Department of the University of New Brunswick, had an opportunity to carefully observe this bird.

Mr. W. A. Squires of the New Brunswick Museum has kindly informed me of the following records of the Scissor-tailed Flycatcher in the province:

1. One shot at Clarendon Station by G. S. Lacy, on May 21, 1906 (Cook, Wells W., Auk 23, 1906:460.)

2. Male collected at Alma, Albert Co. by Fred Rommel, on June 20, 1907. Skin now in N.B. Museum. (Leavitt, A. G., Bull. Nat. Hist. Soc. of N.B., No. 26, 1908:64-65).

3. One collected at Whale Cove, Grand Manan, Charlotte Co., on October 26, 1924.

Skin now in Alan Moses' collection. (Tufts, R. W., Can. Fd. Nat. 39, 1925:86-87).

4. Sight record at Hampstead, Queens County by Stanley Gorham, on July 14, 1948. (Unpublished.) — GEORGE F. BOYER, Dominion Wildlife Management Officer, R.R. No. 1, West Sackville, N.B.

Salvelinus alpinus in Walton Lake, New Brunswick. — A form of the Alpine char *(Salvelinus alpinus)* is found in Walton Lake, King's County, New Brunswick.

Walton Lake is privately owned by the Pejepscot Paper Company. One of the Company's guests wrote to me from New York some years ago describing a fish he had taken in the lake which from the description suggested *Salvelinus marstoni,* the Red Trout of Quebec, now regarded as a form of *alpinus.* As only one specimen was reported it was thought that it might be merely a colour phase of *fontinalis,* the eastern speckled trout. This year Mr. Kaare Smith, local manager for the Pejepscot Company called on me and stated that about ten per cent of the trout taken in the lake were not *fontinalis.* In consequence of Mr. Smith's report I started to investigate the lake and from the lake's caretaker I learned that *alpinus* had always made up far more than ten per cent of the total number of fish annually recorded as taken by anglers. He referred to them as salmon trout.

D. H. Alderdice, who made an examination of the lake, secured a number of specimens which were forwarded to the Royal Ontario Museum of Zoology, where Professor J. R. Dymond and Dr. W. B. Scott confirmed the identification as a form of the Arctic char *(Salvelinus alpinus).*

I have a fairly good knowledge of our Maritime waters and feel convinced that *alpinus* is found in Walton Lake only. The only other indigenous species known to occur in the lake are the eastern speckled trout and American eel. Golden shiners, now present in great numbers were introduced without authorization, probably by some live bait fisherman. Before the introduction of golden shiners, *alpinus* averaged only about five ounces. Now specimens of a pound and a half are common with a maximum of three pounds five ounces recorded.

Professor Dymond in confirming the identification of the Walton Lake specimens as a form of *alpinus* wrote:

"*Salvelinus alpinus,* as you know, occurs as an anadromous species throughout the northern part of the northern hemisphere and is "land locked" in many lakes in all northern lands. In the British Isles it shows so much variation from lake to lake that at least a dozen names have been applied to it. However, Dr. Regan, a former director of the British Museum (Natural History) told me that he had decided that all should be regarded as variants of *alpinus.* So far as I know he never published that opinion.

Populations which have been long isolated usually show variations. How much variation from other forms is required to warrant a specific or subspecific name is one on which taxonomists would differ depending on whether they were lumpers or splitters." — JAMES CATT, Department of Fisheries, St. John, N.B.

Unusual Behaviour of Cormorants. — In the late afternoon of December 31, 1949, I watched two Cormorants diving just a few yards off our rocks. One was a Pelagic Cormorant *(Phalacrocorax pelagicus)* the other was a Brandt Cormorant *(Phalacrocorax penicillatus).* Both dived and the Brandt Cormorant came up with a fish cross-ways in his bill. The fish looked to be about eight inches in length, fairly heavy and coloured a yellow-orange. The Cormorant seemed to be having quite a time with the fish as it was trying to wiggle free. The Pelagic then started prodding the Brandt Cormorant on the back with his bill. The Brandt Cormorant dived three times with the fish in his bill, and each time the Pelagic dived too, coming up within inches of the Brandt. Whenever they surfaced, the Pelagic would swim about the other prodding him on the back and making passes at the fish. Finally the Brandt Cormorant came up with the fish head first in his bill, he then gulped it down with some difficulty. His neck filled out so much that he couldn't move it. The Pelagic swam away.

I presume all the diving etc. was to get the fish in the proper position for swallowing. He must have released the fish in every dive, recapturing it in the attempt to get it into position, presumably because the fish was too heavy to toss and catch in the usual manner. — JEAN M. ODLUM, Triple Island Lightstation, Prince Rupert, B.C.

REVIEWS

Drawings of British plants. Part I. Ranunculaceae. Part II. Berberidaceae, Nymphaeaceae, Papaveraceae, Fumariaceae. *By Stella Ross-Craig. Pt. I, 44 plates, Pt. II, 22 plates. G. Bell & Sons Ltd., London, 1948. In Canada, Clarke, Irwin & Co., Toronto. $1.50 each part.*

This work is planned to illustrate all the clearly defined species of flowering plants growing wild in Britain. It is anticipated that the whole work will include some 1,500 to 1,800 plates and that several years will be required for its completion. The artist is on the staff of the Royal Botanic Gardens, Kew, and the Director of the Gardens, Sir Edward Salisbury, has contributed a brief foreword.

The illustrations are well-executed black and white line drawings. Each includes a habit sketch as well as detailed drawings of flowers, fruits, and critical characters of especial importance in identification. A brief legend appears at the bottom of each plate including in every case a note on flower colour. No distributional data of any kind are given. The drawings appear to be highly accurate as well as of considerable artistic merit. Unfortunately some of the plates are rather crowded. These parts are only bound in a heavy paper cover — obviously unsatisfactory for what is intended as a more or less permanent reference work. — HAROLD A. SENN.

South Nation Valley Interim Report 1948. Recommendations and Summary. *Department of Planning and Development. Toronto, 1950.*

Establishment of the South Nation Valley Conservation Authority on May 8, 1947, was immediately followed by intensive studies that led to an Interim Report. Recommendations of direct interest to naturalists are: establishment of forests including the South Nation Forest of nearly 200,000 acres; designation of part of the pond created by the improved Spencerville mill dam as a permanent wildlife sanctuary; protection of predators of meadow mice; control of stream pollution; studies on the biology of the Hungarian partridge. A short section is included on the wildlife of the area and suggestions for improving the wildlife environment. There are sixteen pages of excellent photographs. — C. FRANKTON.

Audubon's Birds of America. *Popular edition, with introduction and descriptive captions by Ludlow Griscom. The MacMillan Company, New York; 320 pp., 288 coloured plates, 1950 ($3.95 in Canada).*

This "popular edition" of Audubon's paintings of the birds of America is decidedly less satisfactory than was the royal octavo edition published by the MacMillan Company some time ago. In the "popular edition" the plates are reduced, at considerable loss of detail, to approximately 3½ x 5½ inches. In the Acadian flycatcher, white-crowned sparrow, Wilson and orange-crowned warblers, color reproduction is so bad that the illustrations convey little resemblance to the birds they depict. The chipping sparrow, slate-coloured junco, yellow-breasted chat, Connecticut warbler, cedar and Bohemian waxwing, and mockingbird are shown with more or less bright blue or green in the plumage! The jet black head of the Bonaparte gull is here colored a washed-out brown and the vivid red crest of the ivory-billed woodpecker also is brown!

The introduction and captions are by Ludlow Griscom. In the former a number of sides of Audubon are interestingly discussed. Those who do not like the improbable postures of some of Audubon's bird subjects are reminded that this dramatization of his birds was Audubon's revolt against the conventional unimaginative paintings in vogue in his time. — W. EARL GODFREY.

National Wildlife and Conservation Digest, Vol. 1, No. 1, January, 1950, pp. 1-112. *Pike and Kearne, 184 Lanark Street, Winnipeg, Manitoba. ($3.00 a year).*

The first number of this new monthly magazine is a pleasant surprise. As the name on its attractive cover implies, it is a digest of timely wildlife and conservation articles selected from the pages of other reputable North American publications. Forty such articles are contained in the first number. They are well chosen, covering a balanced variety of wildlife subjects, are written informally in highly readable brevity, and are well printed on good paper. Judging by the first number, sportsmen, conservationists, and all who enjoy reading about the out-of-doors will enthusiastically welcome this interesting newcomer. — W. EARL GODFREY.

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The Canadian Field-Naturalist

Vol. 64 OTTAWA, CANADA, NOVEMBER-DECEMBER, 1950 No. 6

PECTINATELLA MAGNIFICA LEIDY (BRYOZOA) IN THE DUNDAS MARSH, HAMILTON, ONTARIO[1]

W. W. Judd

McMaster University, Hamilton, Ontario

DURING THE SUMMER MONTHS of 1946 and 1948 observations were made on colonies of *Pectinatella magnifica* Leidy in the Dundas Marsh which lies along the northern limits of the city of Hamilton, Ontario. The marsh is about 700 acres in extent, and in 1946-1948 about three-quarters of its area was occupied by heavy growths of aquatic and marsh-dwelling plants. The depth of the water was between one and two meters over most of the area and the water was comparatively still, the only outlet of the marsh being a canal leading into Hamilton Bay. The colonies of *Pectinatella* occurred in stretches of shallow water among rushes and about a boathouse.

Davenport (1904) reports that *Pectinatella magnifica* is confined to North America except as introduced at Hamburg, Germany, and he records its occurrence in Maine, Massachusetts, New York and Illinois. In Ontario it has been reported to occur at Go Home Bay and the French River by White (1915) and in the Humber River near Toronto by Huntsman (1913). This bryozoan was first noted by the writer in the Dundas Marsh during July, 1946 when several colonies, each about 6 inches in diameter, were seen floating among rushes in water one to two feet deep. On July 23 a colony 15 cm. in diameter was found encircling a submerged stick and the outer surface of its jelly-like matrix was plentifully speckled with statoblasts. On July 28, 1946, Mr. L. Wragg collected a colony 8 inches in diameter likewise speckled with statoblasts. On Sept. 14, 1948 Mr. R. Sims counted 20 colonies in water surrounding a boathouse in the north-east corner of the marsh and noted that some of these were formed on dead, submerged branches. One elliptical colony measured by Mr. Sims was 14 inches in diameter along its length and 11 inches across its width.

The hooks which project from the circumference of the statoblasts have been used by Henchman and Davenport (1913) in an investigation of the genetic origin of colonies. Davenport (1904) reports that the statoblasts have from 11 to 22 hooks from 0.15-0.25 mm. long, and Henchman and Davenport (1913) record that the number of hooks varies from 11 to 26. In a count of the number of hooks on 827 statoblasts from several colonies collected in Lake Michigan, Davenport (1900) found that the number of hooks per statoblast ranged from 11 to 21 and that the number occurring most commonly was 13. From the colony collected in the Dundas Marsh on July 23, 1946, 517 statoblasts were removed and the hooks were counted. The result of the count is shown in Table 1.

In this case the average number of hooks per statoblast was 15.11 and the number occurring most frequently was 15. This is higher than the average number occurring in the population of 827 studied by Davenport (1900), but in other populations studied by Henchman and Davenport (1913) the most commonly occurring number of hooks per statoblast was 15 or more. Davenport (1900) also studied variations in the form of the hooks and figured several types show-

Table 1. — Number of hooks per statoblast.

Number of hooks per statoblast	12	13	14	15	16	17	18	19	20
Frequencies	3	28	118	195	123	38	8	3	1

[1] Received for publication March 27, 1950.

Vol. 64, No. 5, September-October, 1950, was issued January 18, 1951.

ing that the distal end of the hook may have a single claw, a bifid claw, two claws or two double claws. All the types figured by him show hooks with simple stalks. On one of the 517 statoblasts from the colony collected in the Dundas Marsh on July 23, 1946 there were two hooks at opposite sides of the statoblast in which the base of the stalk originated from the circumference of the statoblast as three short filaments converging to form a tripod supporting the rest of the stalk.

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NOTES ON THE VERTEBRATES, EXCEPT FISHES, OF THE SAULT STE. MARIE REGION OF ONTARIO [1]

FRED WARBURTON,

Owen Sound, Ont.

FROM September, 1947, to June, 1948, I resided a few miles east of Sault Ste. Marie, Ontario, and from September to December, 1948, a few miles north of Bruce Mines, Ontario, about thirty miles east of "The Soo". During that time I had many opportunities to study the land vertebrates of the area.

The most complete account of the fauna of the area which I was able to find is "A Faunal Investigation of the Sault Ste. Marie Region, Ontario.", by L. L. Snyder, E.B.S. Logier, and T. B. Kurata. (Trans. Roy. Can. Inst. Vol. XXIV, Pt 1, 1942.) It comprises a record of the field work conducted by the Royal Ontario Museum in the summer of 1931, and several other pertinent records. Only information which is additional to that in the cited work will be recorded here. (Subsequent references to the above paper will be cited simply as "Snyder *et al.*")

Although I was able to collect very few specimens, I am morally certain of the identification of all the species listed, unless I state otherwise.

Acknowledgment is due to a great number of residents of the Sault Ste. Marie area who gave me invaluable assistance in my work, and who showed admirable patience in answering innumerable questions.

1 Received for publication May 10, 1950.

Snyder *et al* include a detailed description of the area in their paper, on which I shall not enlarge here except to state that, since 1931, portions of the area have been cleared by lumbering, agriculture, and fire, but otherwise the region remains essentially the same.

Amphibians

Necturus maculosus.

MUDPUPPY. One was caught by hook and line in Korah Township, west of "The Soo," and kept for several days in an aquarium. Mrs. W. E. Shaule, of Bruce Mines, says they are occasionally caught in the Thessalon River. Mr. R. H. Burns, of Sault Ste. Marie, reported finding one dead under a wharf at Richard's Landing on St. Joseph's Island, with a group of its eggs nearby.

Triturus viridescens.

NEWT. W. E. Shaule reported finding red, spotted, "Blood Lizards" with flattened tails under logs, etc. He was familiar with the Red-backed Salamander.

Ambystoma jeffersonium.

JEFFERSON'S SALAMANDER. I captured two in ditches two or three miles east of Sault Ste. Marie on April 10,1948.

Plethodon cinereus.

RED-BACKED SALAMANDER. Not uncommon near Bruce Mines.

Rana catasbeiana.

BULLFROG. I discovered one in September, 1947, in the mud of a recently excavated basement near Sault Ste. Marie. The following spring, I heard one regularly, calling from a pond near the mouth of the Root River.

My information concerning the other amphibia of the region is in complete agreement with that of Snyder *et al.*

Reptiles

Thamnophis sirtalis.

GARTER SNAKE. The smallest seen was about ten inches long, September 28, 1948. During October, 1947, I dissected two which had been killed. One had been eating earthworms only. The second had eaten a ten-inch Red-bellied Snake and a small toad.

Birds

I shall omit a number of species of birds which I observed in the region because my data add nothing to those already published by Snyder *et al.*

Branta canadensis.

CANADA GOOSE. A common spring and fall migrant, occurring in flocks of up to two or three hundred individuals but more often in flocks of twenty to fifty. Frequently they could be heard flying overhead shortly after dark, and occasionally they alighted in open fields at night. Mr. W. St. John, game overseer at Thessalon, stated that they are of little importance as game in the area.

A trustworthy farmer at Bruce Mines told me of shooting an albino goose several years ago. The bird was entirely white, with pink eyes and feet. He could not identify it specifically, but described it as lacking a "grinning patch," which would exclude both of the following species.

Chen hyperborea.

SNOW GOOSE. In mid-November, 1947, I saw two flocks of this species flying toward the river a couple of miles east of Sault Ste. Marie. One flock contained about 100 birds (by actual count,) the other, two or three times that number. On November 11, 1948, I saw ten or more flocks north of Bruce Mines, varying in size from 9 to 75 individuals.

Chen caerulescens.

BLUE GOOSE. I saw two or three small flocks at Bruce Mines at the same time as the Snow Geese. This species was much less numerous. Each species appeared to form homogeneous flocks.

Anas platyrhynchos.

MALLARD. I failed to find this species but many hunters knew it.

Anas rubripes.

BLACK DUCK. Occasional as a breeding species. I found an adult and four downy young on the Root River near its mouth on June 13, 1948.

February 7, 1948, was a bitterly cold day, and I was greatly surprised to find two Black Ducks on the ice at the lower end of the Sault ship canal. On February 27, there were ten individuals at the same place. On inquiry, I learned that it was not unusual to find the species there at that time of year. The rapid current of the tailrace of the Abitibi power dam maintains an area of open water throughout the winter, and this proves attractive to several species of gulls and ducks which would otherwise be able to find open water only in deeper or more turbulent areas.

Anas acuta.

PINTAIL. I saw three adult females near the mouth of the Root River, September 21, 1947. The species is apparently one of the more important game waterfowl of the region.

Aythya affinis.

LESSER SCAUP DUCK. A fairly common spring and fall migrant in 1947-48, and an important game species.

Glaucionetta clangula.

AMERICAN GOLDEN-EYE. A common winter duck, remaining on the St. Mary's River as long as open water is available. About 150 apparently spent much of the winter of 1947-48 on the open water at the Abitibi dam and the St. Mary's Rapids at Sault Ste. Marie. Here, they could be seen drifting downstream until they nearly reached the ice at the lower end of the open area, and flying back upstream, so that a constant movement was present in the flocks. Occasionally small groups rested on the ice. As the afternoon darkened, the birds appeared to be congregating on the headrace of the dam, where the water, although swift, was smooth. Even the turbulence of the rapids, however, failed to deter them from feeding there in daylight.

Lophodytes cucullatus.

HOODED MERGANSER. On November 23, 1947, I flushed a male and female from the Root River near Highway 17. Earlier that month I had obtained a wing of the species from a hunter near Sault Ste. Marie.

Mergus merganser.

COMMON MERGANSER. Common throughout the fall and winter on the St. Mary's River, and, after that is closed by ice, on the open water of the rapids and the Abitibi dam, where I found them about as common as the Golden-eye. Scattered pairs were present in the spring on the more isolated streams and islands. On September 5, 1948, there were at least 100 on the rocks in the St. Mary's Rapids, and a few others on the water below the dam.

Cathartes aura.

TURKEY VULTURE. I saw one individual on May 22, 1948, about four miles north-east of Sault Ste. Marie. The bird flew across open fields about a hundred yards from me and at an altitude of about fifty feet. I am fairly well acquainted with the field identification of the species and have no doubt whatsoever that I have named it correctly. No other bird in the region could be confused with it at many times the distance.

Accipiter striatus.

SHARP-SHINNED HAWK. It is regularly but not commonly seen in the region throughout the warmer months. One at Bruce Mines was proudly displayed by a farmer who claimed that it had been killed by his cat.

Accipiter cooperii.

COOPER'S HAWK. Not as common as the Sharp-shin. Otherwise the status of the two species would appear to be similar.

Buteo jamaicensis.

RED-TAILED HAWK. Not common at any time, but I found it a little more common as a migrant than as a resident in the more settled areas.

Buteo lineatus.

RED-SHOULDERED HAWK. I saw only one, circling below me in the air over a deep valley six miles north-east of Sault Ste. Marie on May 22, 1948.

Buteo lagopus.

ROUGH-LEGGED HAWK. Very numerous as a fall migrant in the Bruce Mines area in 1948. From mid-October until late November I saw two or three every day, and a few remained until late December. Residents stated that it was equally common every year.

Haliaeetus leucocephalus.

BALD EAGLE. I have three records for the region, an adult at the Root River, May 19, 1948; an immature individual north of Bruce Mines, September 12; and another adult over the lake at Bruce Mines, December 7.

Circus cyaneus.

MARSH HAWK. I would modify the statement of Snyder *et al*, that this is the commonest hawk of the region, to a statement that it is the commonest breeding hawk. It is far outnumbered in fall by migrant Rough-legs and Sparrow Hawks.

Falco columbarius.

PIGEON HAWK. I have five records of this species, for October 13, 1947; and April 10, June 19, September 6, and October 17, 1948 respectively. Surprisingly enough, the first four are all from within the city limits of Sault Ste. Marie, three of them from the business section. The last record was from north of Bruce Mines.

Falco sparverius.

SPARROW HAWK. A fairly common breeding species. I found a nest in a hollow tree four miles east of Sault Ste. Marie, on June 13, 1948. However, it is in the fall migration that this hawk reaches its greatest abundance. In the fall of 1948, I saw fifteen or twenty daily in fields about Bruce Mines, often in small groups of four or five. One was seen harrying a cat, swinging in an arc just out of reach of the mammal, crying "klee-klee-klee" impertinently until the cat was wild with rage. Possibly a similar but less well judged act resulted in the death of the Sharp-shin described above.

Canachites canadensis.

SPRUCE GROUSE. SPRUCE HEN. According to hunters' reports, this species is now probably extinct, or nearly so, in the Bruce Mines area. Formerly, and still in nearby areas, it could be captured with snares on poles, with which the birds were merely picked from their perches one at a time.

Bonasa umbellus.

RUFFED GROUSE. A common bird of considerable importance as game. Drumming had begun by the middle of May in 1948. By the end of June, many empty nests were in evidence in the deciduous slashings. By mid-September, the birds had begun their movement to the coniferous bush. I found the first snow roost in 1948 on January 19. Snow roosts were usually near the bases of fairly large spruces, the lowest branches of which formed a canopy just above the snow. Each roost contained a pile of bean-shaped droppings in the morning. The birds' tracks showed that they usually walked away from their roosts in the mornings. One individual had used two snow roosts in one night; the first was in an unsheltered position, from which tracks led to the second, nine feet away, which was sheltered on three sides by underbrush.

When the Cloudslee area, north of Bruce Mines, was settled, grouse were much more plentiful than they are now. One old resident told of shooting thirty in one day, all within sight of his house, twenty years ago. At that time, large areas of bush still separated the fields from each other.

Tympanuchus cupido.

PRAIRIE CHICKEN. I flushed two from a puddly open field near the edge of aspen shrubbery on the Garden River Indian Reserve, about two miles north of Highway 17, two or three miles east of Sault Ste. Marie. The birds were identified by their short, dark tails, as I flushed them. Nearby was a nest containing fragments of three buff eggs, spotted with brown, larger than those of a Ruffed Grouse. Possibly the nest was of this species.

Pedioecetes phasianellus.

SHARP-TAILED GROUSE. Not uncommon north of Bruce Mines in open and brushy fields. I saw two or three each week during the four months of my residence there. One was shot on November 12, 1948, from a group of three at Cloudslee, north of Bruce Mines. Such shooting is, of course, illegal, but it occasionally takes place. The hunter showed me the bird, and from him I obtained a wing and the two central tail feathers, which I preserved.

A farmer described ceremonies among these birds, which took place years ago in a hayfield on his farm. The birds strutted about with ooccasional fights, uttering calls "like a crazy owl," with the feathers on the sides of their necks extended. Several people in the Cloudslee area described "Prairie Chickens," with short, dark, rounded tails and darker breasts than the present species. I believe they were probably referring to *Tympanuchus cupido*.

Perdix perdix.

EUROPEAN PARTRIDGE. This species introduced into the region in 1930, still exists in and about Sault Ste. Marie. It is especially often seen in a wooded area near the locks of the Sault Ste. Marie Ship Canal.

Phasianus colchicus.

COMMON PHEASANT. This introduced species is still fairly common on St. Joseph's Island, but I was unable to obtain any data about its status on the mainland.

(Grus canadensis.)

(SANDHILL CRANE). When I arrived in Cloudslee, north of Bruce Mines, in the fall of 1948, I was told of a "wild turkey" which had been seen there by many residents during the preceding summer. The bird, or perhaps two of them, inhabited a wide area of pasture through which flowed a small creek. By questioning several people, I obtained a considerable amount of information about the bird, which I shall summarize below.

1. All those whom I questioned called it a "wild turkey". One believed it to be a cross between a turkey and a "crane," (i.e., a Great Blue Heron.)

2. All my informants were acquainted with the Great Blue Heron, and were certain that the bird was not the same.

3. The "wild turkey" was described as brown in colour (the "crane" was usually described as gray). Several people mentioned red markings on the bird's head. Their descriptions varied from a mention of red spots on the head of the bird to a crest of short red feathers. The "wild turkey's" tail was described as "curved downward." This statement was illustrated by a sweep of the hand in a vertical arc, and seems to refer to the "tufted rear" illustrated by Roger Tory Peterson (A Field Guide to the Birds, 1947, page 86).

4. The bird's voice was loud and sonorous, audible at distances up to a half mile, and

resembled one of the calls of a domestic turkey. It flew with its neck outstretched and legs trailing behind. Usually it was seen walking about on the dry portions of the pasture, and was said by one observer to spend much of its time catching grasshoppers.

5. One observer told of seeing two individuals together, one slightly smaller than the other. One was jumping about, flapping its wings and assuming awkward poses. This, if true, may refer to the courtship "dance" of the species.

6. An old resident told of seeing two similar birds in the area "many years ago." His description tallied in every way with that of the Sandhill Crane. He told how one of the birds had alighted in a field on his father's farm, and had been shot. The second refused to leave, and it too was shot. On investigation, he learned that the birds were "wild turkeys," which he believed to be a western bird.

Charadrius hiaticula.

SEMIPALMATED PLOVER. I saw two on the rocky shore of the Sault rapids on May 24, 1948.

Philohela minor.

AMERICAN WOODCOCK. Found in suitable localities from April until late in fall. I found one on June 15 near Sault Ste. Marie, showing considerable reluctance to leave a small area, but I was unable to find a nest. My latest record is November 3, 1947.

Larus argentatus.

HERRING GULL. Common throughout the region in summer. In spring and fall, flocks of up to 60 or 80 individuals feed in freshly ploughed fields. A few spent the winter of 1947-1948 near the open water at the rapids and the Abitibi dam.

Larus philadelphia.

BONAPARTE'S GULL. I saw one in winter plumage at the C.P.R. dock at Sault Ste-Marie, September 20, 1947.

Sterna hirundo.

COMMON TERN. A few could be seen every day on the river at Sault Ste. Marie from the middle of May until early in the summer of 1948. They were common again in September and I frequently saw several hundred in one day. On September 5, I watched a flock of over 100 on the rocks at the lower end of the St. Mary's Rapids. The young birds were still being fed by the adults, which carried small fish to them, often held crosswise in their beaks, and frequently fed them while hovering.

Columba livia.

ROCK DOVE. Fairly common, but not abundant in Sault Ste. Marie. Occasional individuals and small flocks were found throughout the region.

Zenaidura macroura.

MOURNING DOVE. Scarce, but I saw it in the Cloudslee area.

Ectopistes migratorius.

PASSENGER PIGEON. Now extinct. The Cloudslee area was first settled *circa* 1870. According to the reports of old residents, and stories handed down from one generation to the present, wild pigeons were "as thick as black flies" at that time. One old man, who entered the area about 1884, told me that he often saw thousands while driving along the roads. He thought they were not often shot in large numbers in the area, but nevertheless they disappeared within a few years.

The Sault Daily Star of December 24, 1946, describing the settling of the Cloudslee area about 1875, states that ". . . numerous rabbits, partridge and wild pigeons and also bears were numerous. (*sic*)."

Apparently, then, the Passenger Pigeon still existed in numbers in the District of Algoma at least as late as 1880.

Coccyzus erythropthalmus.

BLACK-BILLED CUCKOO. Not uncommon. I found a nest on June 14, 1948, on the ground in the centre of a small clump of willow shrubs a few miles east of The Soo. It was lined with willow catkins, and contained three eggs.

Otus asio.

SCREECH OWL. I failed to find this species but many residents were thoroughly familiar with it.

Bubo virginianus.

GREAT HORNED OWL. I heard one near Bruce Mines, September 7, 1948, and preserved a wing from one which was shot at Cloudslee on November 21.

Nyctea scandiaca.

SNOWY OWL. According to the reports of residents, it visits the region in large numbers in some winters.

Surnia ulula.

HAWK OWL. There is a mounted Hawk Owl in the lobby of the Sinton Hotel in Thessalon. I could not trace its origin with certainty, but it probably came from nearby.

Strix varia.

BARRED OWL. I found a dead Barred Owl suspended in a roadside tree in January, 1948. It had probably been shot on suspicion of stealing chickens.

Asio flammeus.

SHORT-EARED OWL. On February 7, 1948, I saw one perched low in a tree near the Sault Ship Canal.

Caprimulgus vociferus.

WHIP-POOR-WILL. Fairly common in suitable areas. The residents of the region frequently confuse this species and the Nighthawk, believing that they are the same species, of which only those individuals living in the woodlands "sing."

Dryocopus pileatus.

PILEATED WOODPECKER. I found this species moderately common in coniferous bush, often feeding in hardwood bush, and occasionally found on roadside telephone poles. Unfortunately it offers an almost irresistible target for a much-too-common class of hunters.

Eremophila alpestris.

HORNED LARK. I found this species a common spring and fall migrant, but less numerous as a summer resident.

Perisoreus canadensis.

CANADA JAY. I found it fairly common, at least in winter, in the rural areas of the region. On December 7, 1948, I saw two in the town of Bruce Mines. R. H. Burns, of Sault Ste. Marie, told me that the species had regularly visited his winter feeding station until 1945 or 46, after which he had not seen it in the city.

Corvus corax.

RAVEN. A regular winter resident in the region. My earliest fall record is October 29, 1947. They remained until the middle of March the following year. In Tarentorus Township, adjoining Sault Ste. Marie on the East, I saw two together at intervals of one day to one month throughout the winter. Such long intervals during which the birds did not appear may indicate a very extensive winter foraging area. I saw a lone individual flying over the central part of Sault Ste. Marie on January 31, 1948. Other individual records are Echo Bay, January 5; Cloudslee, November 6.

Corvus brachyrhynchos.

AMERICAN CROW. A very common breeding bird. My latest fall record is November 13, 1948. However, I heard reports that a few sometimes winter near the open water at the Abitibi dam, and a Cloudslee farmer, who was quite familiar with the Raven, said that he occasionally sees Crows in winter.

Parus atricapillus.

BLACK-CAPPED CHICKADEE. A common resident. In the breeding season, in my experience, it retires to densely wooded areas, although a small woodlot is sufficient for at least one pair. In fall and winter the birds join mixed flocks and can be found in almost any habitat, from dense coniferous bush to burnt-over areas thinly grown with aspens only five or six feet high, and the city.

Parus hudsonicus.

BROWN - HEADED CHICKADEE. I did not find this species, but several reliable people reported it from their winter feeding stations in Sault Ste. Marie.

Sitta canadensis.

RED-BREASTED NUTHATCH. Common throughout the colder months of the year, from September on. It occurs in mixed flocks of Chickadees and Brown Creepers, but is apparently restricted to the larger coniferous trees. (Snyder *et al* remark on the fact that they failed to find the White-breasted Nuthatch, *S. carolinensis* in the area. None of the residents with whom I spoke knew the species, nor did I see it during my time in the region).

Certhia familiaris.

BROWN CREEPER. A fairly common winter resident in the coniferous woods, where it was usually found in the company of chickadees and Red-breasted Nuthatches.

Troglodytes troglodytes.

WINTER WREN. My only three records, two of them rather doubtful, are for October, 1948 at Cloudslee, in spruce forest.

Dumetella carolinensis.

CATBIRD. I saw it three of four miles east of Sault Ste. Marie on May 23 and June 13, 1948.

Hylocichla guttata.

HERMIT THRUSH. Common in farm woodlots. My earliest record is May 19, 1948, but the species probably occurred before this.

Hylocichla minima.

GRAY-CHEEKED THRUSH. I saw one on September 10, 1948, in dense, damp spruce bush at Cloudslee.

Hylocichla fuscescens.

VEERY. Fairly common. I found an adult feeding a youngster just out of the nest on June 15, 1948.

Regulus calendula.

RUBY-CROWNED KINGLET. I found this species only as a fall migrant, usually in spruces.

Anthus spinoletta.

AMERICAN PIPIT. Not uncommon as a fall migrant in September, 1948. I once saw a flock of about 200 individuals in a ploughed field at Cloudslee.

Lanius excubitor.

NORTHERN SHRIKE. I saw two individuals, separately, within the city limits of Sault Ste. Marie on December 19, 1947.

Sturnus vulgaris.

STARLING. A common resident, nesting in the cities and throughout the cultivated areas where it competes with some native birds for nesting sites. In winter I found none in rural areas, but the species was fairly common in Sault Ste. Marie.

Vireo philadelphicus.

PHILADELPHIA VIREO. On May 15, 1948, I heard and saw one of this species in the Garden River Indian Reserve.

Vermivora peregrina.

TENNESSEE WARBLER. I saw several on May 23 and 24, in and near Sault Ste. Marie, in 1948.

Dendroica petechia.

YELLOW WARBLER. Not common in summer, but not unusual as a spring migrant.

Dendroica tigrina.

CAPE MAY WARBLER. I saw a male of this beautiful species a couple of miles north of Sault Ste. Marie, in a roadside tree, on May 22, 1948.

Dendrica palmarum.

PALM WARBLER. Not a rare migrant. I saw four together on September 28, 1947. My latest record was October 13 of the same year.

Icterus galbula.

BALTIMORE ORIOLE. On May 24, 1948, I saw a male and heard it sing, in a tree in Sault Ste. Marie.

Euphagus carolinus.

RUSTY BLACKBIRD. On June 17, 1948, I found a male Rusty Blackbird about two miles east of Sault Ste. Marie, near Highway 17.

Hesperiphona vespertina.

EVENING GROSBEAK. A common winter resident in 1947-48. I saw it as late as May 23, 1948, often, at that time, in isolated pairs.

Carpodacus purpureus.

PURPLE FINCH. A fairly common winter resident, usually inhabiting spruces. I also found it, in May, in pairs throughout the region, where it is known to breed.

Pinicola enucleator.

PINE GROSBEAK. All my records of this species are for November 1947 and 1948.

Spinus pinus.

PINE SISKIN. Common in winter. The largest flock which I saw consisted of about 35 birds, November 21, 1947.

Spinus tristis.

AMERICAN GOLDFINCH. My latest record is November 16, 1947.

Loxia curvirostra.

RED CROSSBILL. I have a definite record of one individual, and a possible record of four others, for December 6, 1947, in white pines a few miles east of the Soo.

Loxia leucoptera.

WHITE-WINGED CROSSBILL. Common but irregular in occurrence in the region in winter. I have records for most of the areas

under study during the winter of my residence. My earliest fall record is for October 23, 1948.

On October 27, 1948, I watched a flock of fifty to seventy-five Crossbills work over a forty-foot spruce at Cloudslee. The falling cone scales produced a rustle audible twenty yards away, and the "wings" discarded from the eaten seeds resembled light snow. One cone scale which I examined was still complete, and showed the depression in which the seed had rested, although others had been more roughly handled. On December 1, one flew low in a spruce to the rail of a fence, where it apparently ate several mouthfuls of snow before returning to the tree.

Pooecetes gramineus.

VESPER SPARROW. Joseph J. Hickey (A Guide to Bird Watching, 1943), after giving two exceptions, states, "In my experience, all other male vespers have used fences or very low telephone poles [as singing perches]". In the Rankin Location, a school section a couple of miles east of Sault Ste. Marie, this species is common in an area of dry, sandy fields, in which aspens up to six or eight feet tall grow sparsely. Although the fields are separated by fences, the birds almost invariably used the trees as singing perches, and I never saw one sing from a fence at any time. Possibly northern Ontario's vespers are not yet as accustomed to civilization as Mr. Hickey's.

Junco hyemalis.

SLATE-COLOURED JUNCO. A fairly common breeding species, but much more abundant as a migrant.

Spizella arborea.

TREE SPARROW. An abundant migrant. The number seen daily in the fall of 1947 dwindled from several flocks of twenty or thirty about October 20, to a last individual on November 9.

Spizella pallida.

CLAY-COLOURED SPARROW. Rare, but locally common. In 1948, I found two nests in the Rankin Location. I have described (in press) the nesting of the species there in greater detail.

Zonotrichia leucophrys.

WHITE-CROWNED SPARROW. I flushed one from a roadside in Tarentorus Township, east of The Soo, on September 17, 1947.

Melospiza lincolnii.

LINCOLN'S SPARROW. I saw one on September 12, 1948, at Cloudslee.

Plectophenax nivalis.

SNOW BUNTING. A common winter resident, from November 30, 1947, until March 2, 1948, occurring in flocks of up to 100 birds. In 1948, they reappeared on November 27.

On March 2, 1948, I saw a collie dog catch his leg in a wire fence. In spite of his yelps and the cries of children, a group of eight Snow Buntings circled overhead during the excitement and alighted for a minute in a nearby aspen.

Mammals

As with the other groups, I shall record here only information which differs from, or adds to, that published by Snyder *et al.* I had very little opportunity for trapping in the Sault Ste. Marie region, and I fear that my notes on most species of mammals are excessively brief.

Blarina brevicauda.

SHORT-TAILED SHREW. A very common species. A total of 300 trap-nights in late September, 1947, in Tarentorus Township, produced a total of 16 individuals, and only one other mammal, a Cinereous shrew, *Sorex cinereus*. One hundred and fifty trap nights were in a habitat consisting of dry, sandy soil with a waist-high undergrowth of bracken, a thin growth of aspens up to twenty feet tall, with occasional small pines, spruces, and larches. The ground cover consisted of grass, small areas of moss, and six-inch blueberries. A few very old stumps and logs were present. This area produced six shrews. The other 150 trap nights were in similar, but damper, areas, with higher trees, and a two-inch layer of black leaf mould over the soil. This area produced ten Short-tails and the Cinereous Shrew.

I saw only one *Blarina* active during daylight.

During November of 1947, I studied the trails of this species on the surface of the snow. The longest trail was 28 yards in length, including a loop, and covered a straight line distance of 22 yards. On several occasions, the tracks crossed those of weasels. Neither animal appeared to have paid any attention to the tracks of the other, except that in one case a shrew had turned slightly

to one side to pass between two prints of a weasel, rather than cross that depression in the snow.

Lepus americanus.

VARYING HARE. One which I saw on November 19, 1947, was beginning to turn white. On November 20, 1948, a farmer told me of seeing one which was still entirely dark, although he had seen a white one the preceding day. One shot on December 4 was entirely white except for a few black hairs mixed with the white on the mid-line of the back.

A resident told me that twenty years ago he had shot rabbits with a slingshot, but had never found them so abundant since.

Castor canadensis.

BEAVER. This species now occurs in numbers near the Thessalon River, on the mainland, as on St. Joseph's Island.

Napaeozapus insignis.

WOODLAND JUMPING MOUSE. I found one, dead, in a water-filled pail in aspen bush, on June 7, 1948. Unfortunately it could not be preserved.

Vulpes fulva.

RED FOX. A common animal. Farmers in the Cloudslee area said that they vary in numbers from year to year, but were more common in 1947 and 1948 than in other recent years. I heard reports of black, gray, and cross foxes in the Cloudslee area, as well as one variation with a wooly coat without guard hairs.

In winter, foxes use the smooth, snow-covered ice of the St. Mary's River as an easy route from place to place.

Euarctos americanus.

BLACK BEAR. Fairly regular in all but the most settled parts of the region.

Mustela erminea.

SHORT-TAILED WEASEL. A common animal. Occasionally it destroys poultry. On December 15, I found one alive in a small milk house, which it had entered through a two-inch drain pipe set in the wall at floor level. It was entirely white with a black tail-tip. I managed to capture it alive by squeezing it between the door and the sill as it attempted to escape. In a temporary cage, it bit fiercely at my fingers or my handkerchief, but ignored other objects which I inserted. Possibly it bit at those which smelled most strongly of man.

Lutra canadensis.

OTTER. Mr. Wm. Shaule, of Cloudslee, told me that otter tracks are still occasionally found along the Thessalon River north of Cloudslee.

Mephitis mephitis.

SKUNK. On June 7, 1948, I met an adult skunk carrying a "kitten" a few days old on a path through aspen bush. A few yards from me, she stopped and began stamping her front feet. I prudently backed away, and the skunk picked up the youngster and gallumphed off with it. She followed a remarkably straight course for several hundred yards. A few minutes later, I again met her travelling in the opposite direction on the same route, without the kitten.

Lynx canadensis.

CANADA LYNX. Mr. W. E. Shaule told me that they were occasionally trapped in and near Cloudslee about 25 years ago.

Cervus canadensis.

WAPITI. ELK. Two Cloudslee farmers, Mr. W. E. Shaule, and Mr. Art Chapman, Jr., told me that elk are still found, very rarely, in the Cloudslee area. The species was introduced in 1934.

Odocoileus virginianus.

WHITE-TAILED DEER. A common and important game species, and a major attraction for tourists. It forms an important addition to the food supply of many farmers in the region. The Sault Daily Star, December 24, 1946, mentions that no deer were found in the woods when Cloudslee was first settled, about 1875.

Rangifer caribou.

WOODLAND CARIBOU. Mr. W. St. John, game overseer at Thessalon, told me that there had been a caribou in the Cloudslee area a year or two before my visit in 1948 but it had finally disappeared. He believed that it had probably been shot. Mr. Wm. Vaughn reported that when he first arrived in Cloudslee, about 1884, caribou had been numerous. Mr. Art Chapman, Jr., said that his parents had told him the same thing.

BREEDING BEHAVIOUR OF THE RING-NECKED PHEASANT ON PELEE ISLAND, ONTARIO[1]

K. E. BALL

OPTIMUM RANGE for the ring-necked pheasant, one of Ontario's most important game birds, is found on Pelee Island. Apart from tiny Middle Island, Pelee Island is the southernmost land in Canada. It is located nearly in the centre of the western end of Lake Erie, one of the island archipelago which stretches across from Point Pelee on the Canadian mainland to Sandusky on the United States mainland. Most of the central part of the island is reclaimed marsh, brought about by a series of drainage canals. The island has an area of between 9,000 and 10,000 acres.

This study was begun as a thesis for the graduate school, Cornell University, Ithaca, N.Y., and was carried on with the assistance of the Department of Lands and Forests of Ontario, during 1946, 1947 and 1948.

After the 1947 shoot there was a ratio of one cock to 10 hens, and there were about 500 cocks left on the island. This disparate sex ratio was one of the interesting factors of the Pelee Island pheasant study. Shick (1947), with limited data in Michigan, has suggested that a 10:1 ratio of hens to cocks may still produce adequate harvestable surplusses. This was the case on Pelee Island.

As spring approached the winter flocks broke up and there began a general dispersal of the birds over the island. This was proved by the individual marking method (Taber, 1949). As spring progressed the birds were seen more and more in the larger soy bean fields near the middle of the island; during the winter few, if any, were seen in these fields.

The breeding cycle of pheasants has been studied by Leffingwell (1926), Randall (1940), Strode (1942), Baskett (1947) and Taber (1949). These writers all speak of pheasant "territories" or "crowing areas" being established by the cock in spring. Territoriality exists as a part of a behaviour pattern in many kinds of animals . . . birds, mammals, reptiles, fishes, and some invertebrates. Burt (1949) suggests that it is advantageous for individuals to possess a territorial trait, and that management techniques for animals possessing this trait must be founded on this basic information to be successful.

Nice (1941) has defined bird territory as follows: "The theory of territory in bird life is briefly this; that pairs are spaced through the pugnacity of males toward others of their own species and sex; that song and display of plumage and other signals are a warning to other males and an invitation to a female; that males fight primarily for territory and not for mates; that the owner of a territory is nearly invincible in his territory; and finally that birds which fail to obtain a territory form a reserve supply from which replacements come in case of death of owners of territories."

If many authors are consulted they are unanimous on only one point — a territory is a defended area.

The Pelee pheasants certainly fulfilled a part of Nice's definition . . . they advertised by crowing, they defended by fighting, and they displayed to females on their territories.

Territory, on the whole, was evidenced by plasticity. Baskett (1947) found this to be the case in Iowa, where he tried to map pheasant territories but found the territories were subject to frequent readjustments, even through the nesting phase. Taber's (1949) research in Wisconsin agreed with these findings.

On the island at times a cock would defend a certain area, at other times he would not. In April during the height of the crowing season a territory was fiercely defended, and as time progressed it was defended less and less, or perhaps sporadically so, until finally the territorial boundary between two cocks could not be distinguished by their actions.

Advertisement

Leffingwell (1926) considers the "crow" of the pheasant to be both a warning to other males not to trespass, and an announcement to the females where their mate is to be found . . . in other words, the pheasant crows to advertise. This consists of the cock standing erectly, and, with head up, uttering a loud two syllable call, followed by a rapid

[1] Received for publication May 29, 1950.

beating of the wings. The calls of different cocks may vary considerably in pitch and intensity.

It is customary to think of the cock pheasant as crowing most frequently from an hour before dawn until an hour after sunrise. This is not a hard and fast rule but a good general one during the height of the crowing season.

Practically no crowing was heard in January. During February and March crowing was infrequent and sporadic.

A crowing count census, as described by Kimball (1949) was taken twice a week from March 22 to May 31, and once a week from then until July 3. Seven stops were made, one mile apart, as the Pelee roads are roughly seven miles from one end of the island to the other. The Kimball routes were 20 miles long. The resultant curve should rise slowly in March, reach a peak in late April, hold this peak until nearly the end of May, then decline until the end of June, and from then gradually diminish. Any population indexes should be taken during the time of the flat top of the curve, roughly late April till late May. This flat top to the curve is the factor which makes crowing count censuses possible.

The Pelee curve went from a low of eight on April 21 to 91 on April 24, then 149 April 25, falling precipitously to 32 on April 27. There are probably several reasons for this, perhaps the main one being audibility. Banko, of the South Dakota Department of Game, Fish and Parks, has been studying the radius of audibility of pheasant calls (Kimball, 1949). His studies indicate that normal pheasant calls may be heard roughly nine-tenths of a mile. We did not find this to be true on Pelee Island. One half a mile was more average, and one quarter mile at times best. Humidity had no apparent effect. One of the best crowing mornings we had was in a heavy fog, such that visibility was less than from one telephone pole to the next.

A wind, on the other hand, made quite a difference to audibility. Kimball (1949) found winds above eight miles per hour influenced crowing counts considerably, and counts should be taken on mornings with less wind than this.

Mr. A. W. Stokes, leader of the Pelee Island Pheasant Project, co-operated on this census, in which we tried to plot the position of all cocks on the island. On mimeographed maps of the island we plotted cock positions by two methods — cock-cruising and triangulation.

The first method consisted of driving slowly on all roads and trails, plotting the location of all cocks seen or heard. The second method entailed the use of three people (and sometimes four) who started an hour before dawn, with watches synchronized, and stood on three sides of a woodlot for intervals of two, five or ten minutes, depending on how frequently the cocks were crowing. Arrows were drawn on the maps in the direction of the call, with the time to quarter seconds. The arrows were made different lengths according to how far away the bird was judged to be. After about five stops in one morning the crew gathered, compared maps and times, and where two (or three) lines crossed, a cock was indicated on the master map.

This triangulation method involved many adjustments. Since it was assumed first that a crowing cock could be heard for half a mile the observers were stationed about a mile apart. This assumption proved to be erroneous and it was later found that a quarter of a mile interval was more practicable. Even this was too far certain mornings.

A total of 370 cocks were actually plotted in this way by the end of June. The question then remained how many cocks were non-crowers, or in some other way were not counted?

Not a single non-crowing cock was observed by either Stokes or myself during this spring of 1948. Leffingwell (1926), Strode (1942) and Randall (1940) make no mention of non-crowers, but Taber (1949) found eight out of 21 cocks to be non-territorial and therefore non-crowers (by his definition), in the season of 1948 in Wisconsin. There were certainly some non-territorial cocks on Pelee Island, which could have been missed on the crowing counts due to their position. One such cock, tagged green 99, was seen to crow on several occasions however, so this is not in agreement with Taber's (1949) findings.

On the basis of the number of cocks seen on Fishing Point by repeated cruising, compared to the number recorded by the triangulation method I estimated 450 cocks to be present on the island in the spring of 1948. This figure was later corroborated by other census methods used by Stokes.

This triangulation method was very time-consuming and is not to be recommended for such a large area. As far as a population census is concerned some variation of Kimball's (1949) crowing count census would

probably be more useful and equally exact, as well as taking less time.

The triangulation method did show some good correlation between the pheasant territories and the cover available. The heaviest cock populations on the island were on Fishing Point in the southwest part of the island, around the scrublands in the southeast corner, and the southern part of the west side, at Lighthouse Point and around the woods at the central part of the north end of the island. The central part of the island, with most of the large soy bean fields, had a much smaller population. The map derived from this method strikingly showed this relation between the land economy and the spring territories of cock pheasants. The distribution of the areas of uncultivated land is one of the chief reasons the pheasant population remains at such a high level.

several reasons. This time limit appeared to give a reliable sample even in very low populations, time was limited, and it was found hard to concentrate for a longer time.

According to the data presented in Table 1 the Kimball crowing count census could be used as a population index (the purpose for which it was intended) but not for a real census in the strict sense. None of the Pelee cocks were found to crow at an average rate of one call per two minutes or less, consequently to use this method as a census the time required at a stop would have to be longer . . . four minutes or more, at the height of the crowing season on Pelee Island.

Display

The display of the cock pheasant is a magnificent performance. Often on Pelee they would make preliminary short rushes toward

Table 1

PHEASANT CROWING RATES

Date	no. calls given by one cock	average time between two successive calls (minutes)	time range between two successive calls (minutes)
April 27	24	2.4	1 - 5
April 30	5	3.0	2 - 4
May 3	20	3.0	1 - 7
May 28	12	2.7	2 - 4
May 29	20	3.4	1 - 11
June 9	29	3.4	2 - 8
June 24	15	3.4	2 - 5

Individual crowing rates of cocks were recorded over a period of time coinciding with the triangulation crowing census, to gauge the time required at each stop for maximum efficiency of the census.

Kozlowa (1947) found that the peak of sexual activity of the male pheasants of Tadjikistan was March 15 (it is about a month later on Pelee Island), and that during this period the cocks crow every four or five minutes. The height of the crowing season on Pelee seemed to be from about April 20 to the end of May. During this time they have a faster crowing rate than Kozlowa reports for the Tadjikistan birds. Table 1 shows the rate of crowing of Pelee Island cocks between April 27 and June 24.

Kimball's (1949) crowing count census was based on a two-minute interval for

one hen though another hen might be much closer. With head lowered, tail spread like a fan with its tip tilting in the direction of the hen, and ear tufts raised (usually), they circle the hen, often so close that their feathers brush. Usually the hen stands still, looking around, and apparently not impressed by the cock's display. When the cock has made three-fourths of a circle the hen usually runs off a few yards and pauses. The cock straightens, repeats his dash and slow circling. Randall (1940) reports that the male may hold this crouched position several minutes. This display may occur eight or 10 times with the same hen, but does not necessarily result in copulation. One cock (April 29, 4.30 p.m.) displayed 14 times in rapid succession to one hen in a 15-minute interval. Taber (1949) has reported up to 12 displays in one series.

Toward the latter part of the season the hens would sometimes make the first advances, their peak of sexual activity occurring somewhat later than the males'. Kirkpatrick (1944) found that in its seasonal development, the ovary lagged behind the testes more than a month although the growth of the ovary was more rapid. Kozlowa (1947) speaks of March 15 as being the time of the peak of sexual activity of the male Tadjikistan pheasants, while the "organs of the female were still quiescent".

In between displays or crows the cock would sometimes shake himself. Occasionally the hens would do this also. Toward the end of the mating season the hens often raised their wings over their heads in a stretch (Taber, 1949, records this also), which seemed to be a method of attracting the cocks' attention.

From a peak in displaying there was a gradual lessening of interest although the hens appeared interested for a longer time than the cocks, as witnessed by hens coming up to a cock June 9, feeding about an inch from his beak, only to have him ruffle his feathers and turn away. This happened with greater frequency as June advanced — hens would lift their wings, ruffle their feathers, and upon occasion crouch down in front of a cock, only to have him turn away disinterestedly.

At times the courtship became quite violent. On April 26 a cock made a dash at a hen, grabbed her by the back of the neck, swung her off her feet and three times around before she managed to escape. On April 18 a cock chased a hen around seven times in a circle, then she ran off a few yards with him following. Finally he grabbed her with his beak, lifted her off the ground and a considerable struggle ensued, involving swift wing flaps and flying feathers, before she broke away. The cock then displayed with much less apparent energy to two other hens. A few minutes later a hen approached him as he stood still, fed with her head only three or four inches from his, but he didn't bother to look up. Finally there were seven hens in a circle around him . . . he ruffled his feathers but just stood. This continued for three quarters of an hour when suddenly, with no display or warning, he turned to the closest hen, mounted and copulated. Some 10 minutes later he displayed to another hen. Then he made a 50 foot dash across the field to a third hen, displayed once, grabbed her neck with his beak and swung her around five times before letting her go, at which she flew to the edge of the field and looked back. Taber (1949) records only one instance of a hen being apparently lifted off the ground, but there was no mistaking its occurrence on Pelee Island.

Leffingwell (1926) reports males displaying to each other as being not uncommon. Perhaps because of the disparate sex ratio this was not observed on Pelee Island.

Mating

Copulation was observed 19 times between April 18 and June 20. On April 26 a cock mated at 10.21 a.m. and again at 10.31. Similarly on May 5 a cock mated at 7.03 and again at 7.05 with another hen, an interval of only two minutes. On May 14 a cock mated at 7.10 and again at 7.24 a.m.

Three cases were noted where after copulation the cock gave the hen a vicious peck on the forehead. Two of the 19 matings were on invitation of the hen. On June 9 a cock was observed mating with a hen and within the same minute another cock, who apparently had priority on this territory, came rushing forward. The first cock hurriedly departed and the second cock then displayed to the same hen.

Defense

Many authors who have worked with pheasants report active fighting . . . Leedy and Hicks (1945), Wight (1945), Sharp and McClure (1945), Beebe (1918), Randall (1940), Buss (1946), and Taber (1949). It is therefore odd that Kozlowa, studying pheasants on their native ground, failed to see this, and speaks of domains (areas where cocks feed and mate) rather than territories (defended area).

Several instances of active defense were observed on Pelee Island, four of these between hens, the rest between cocks. No instances of cock and hen battles were observed. Some of the defenses consisted of pitched battles, others merely of chasing, with no opposition on the part of the intruder.

Sometimes the defense appeared as a mild form of "jitterbugging", or what Taber (1949) calls "sparring". Such a fight occurred March 22. At seven a.m. a cock emerged from the woods, fed for a few minutes among 14 hens in a soy bean field, then began walking due south, pausing only twice to feed briefly until he passed one cock (neither paying any

attention to the other) and about 15 feet farther he met another cock head-on. At first they crouched facing each other, breast feathers touching the ground, tails straight up, jabbing at each other with their beaks. First one, then the other, would leap into the air, perhaps about four feet. They parried each other's thrusts, their tails going straight up, then down and up in sudden jerks. This continued for 10 minutes, while hens wandered around them within a few feet, but paying no attention. (Randall, 1940, thought that battles were often brought on by the presence of hens.) A non-participating cock wandered within 20 feet or so, but did not join the battle. There was a five minute intermission in the battle while the two cocks fed, then they again assumed sparring positions. The third cock, at this point, herded 16 hens south with him about 40 feet, leaving only three near the antagonists. Again the savage jabbing began, the three hens coming within two feet of the fight, but apparently paying no attention to it.

Sometimes one cock or the other would back up from a thrust, but more often they stood their ground. The invader would occasionally begin the aggression. Sometimes they would crouch four or five minutes just eyeing each other, then the tail jerking would begin again.

At 7.50 the original aggressor retreated toward the wood from which he had emerged, slowly feeding as he went. During this battle, which lasted 50 minutes, no blood was shed. Buss (1946) shows a photograph of one cock killed by another in battle in Minnesota.

All other battles were similar. The fights between hens were as vicious as those between cocks.

At the end of one cock fight the intruder gave a raucous screech before walking back to his own area. Aside from this one instance the battles were voiceless. Strode (1942) records instances of the victor crowing once or twice after battle.

On another occasion when two hens were fighting, a cock slowly circled them like a referee, and finally they had to avoid him to continue fighting.

During the period between 6.20 a.m. and 7.50 a.m., June 9, I observed a cock defend his territory four times by giving chase to other cocks entering it. In each case the intruders took flight, apparently recognizing his prerogative. This same cock on June 23 watched another cock on his territory and merely looked, offering no opposition whatsoever, suggesting that by this date his pugnacity had subsided and his territory was no longer in need of defense. This same cock showed active defense of his territory on April 24, April 27, April 28, and yet did not defend it May 25, in what might be considered still the defensive season, when another cock came onto his territory. It may be observations such as these which led Leedy and Hicks (1945) to write: "Observations in Ohio indicated that such territories (as those described by Wight, 1933) are not always clearly defined, although . . . the range of individual males and females may not be more than a few acres."

Several islanders spoke of cocks mutilating each other in former years, but this was not observed in the spring of 1948. Active defense, however, was certainly in evidence.

Territories

Kozlowa (1947) speaks of "strictly defined cruising routes" rather than territories, along which the cock moves, routes of not over 400-500 metres in length, and which take the bird 30-40 minutes to traverse. This did not appear to be the case on Pelee Island. One individual bird was under observation for four hours in the morning and one in the afternoon, and it certainly did not travel along a well defined route, but rather seemed to wander at will, always within a certain area.

In order to study the manifestations of territorial behaviour in Pelee pheasants five cocks were chosen on adjacent, or near-by, areas and their activities recorded from day to day, as far as possible. These areas were surveyed and tags put up in strategic places at known distances from each other. In this manner a cock's progress could be recorded in an organized fashion and plotted on a map. (see figure 1).

In 10 hours and 43 minutes of observation dispersed from April through June, Cock A was seen to crow 61 times, display 11 times, and mate twice on his area of between two and three acres.

Similarly, Cock B, in three hours and 19 minutes of observation was seen to crow 16 times, display 11 times, and mate twice on his area of 3+ acres. Detailed observations of these two cocks ceased at the end of May

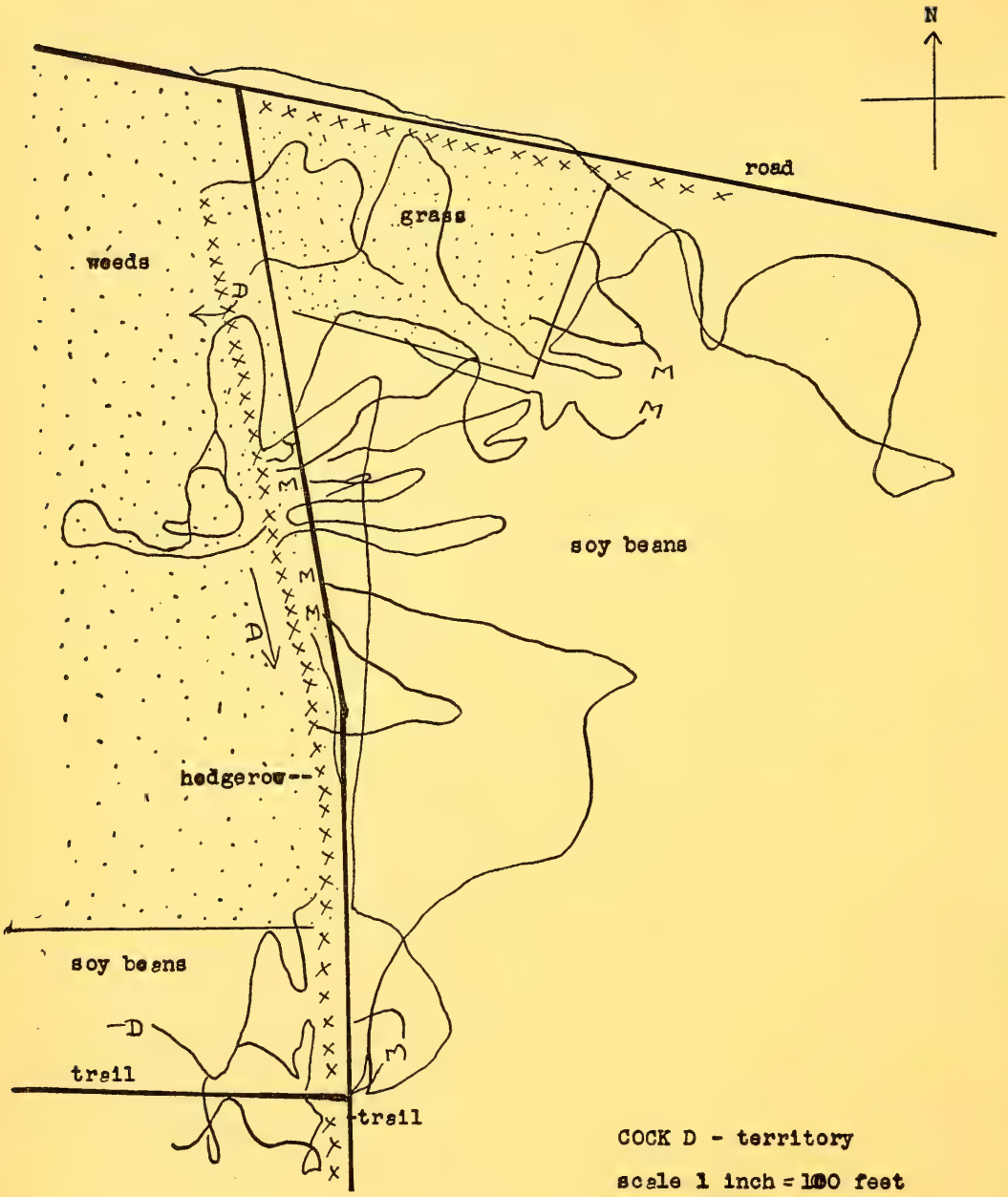

Figure 1.

as the rye in their areas grew to such a height it was impossible to follow their movements.

Cock C's meanderings give a more definite picture. From the middle of April, until the end of June, in 10 hours and 16 minutes of observations he was seen to crow 91 times, display 14 times and mate three times. No other cock was seen to cross his territory without some form of defense. Most of his trips were within 100 feet of one of the two hedgerows involved, though several wider excursions occurred. He traversed an area of about six acres. Cock D had a still larger territory of about 11 acres. Here he was seen

to crow 226 times, display 54 times and mate six times. Eighteen hours and 28 minutes were spent in these observations.

Adjacent to Cock D was Cock E, who crowed 142 times, displayed seven times and mated twice in eight hours and 38 minutes of observations, on what appeared to be an area of roughly six acres.

The cover on the territories of these five cocks was much the same. Each territory had at least one hedgerow containing an over foliage of mainly *Rhus typhina,* and *Cornus* sp. with a weedy undergrowth of *Vitis* sp., *Rhus toxicodendron, Ambrosia elatior, Rumex obtusifolius, Poa annua, Arctium minus* and others. All five territories had an open section . . . four with stubble bean fields, the fifth with an open pasture. Besides the hedgerows for nesting cover three cocks' territories had adjacent weed fields. Petrides (1942) gives a discussion of the relation of hedgerows to wildlife and concludes that hedgerows are the most favoured spots in winter. For nesting he concludes that a 10-foot hedgerow is a desirable location. Nearly all the hedgerows on Pelee Island are at least this width.

The dispersion of good nesting cover and abundant food on Pelee Island makes possible the large pheasant population obtaining there.

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COLOUR PHASE INVESTIGATIONS ON THE SCREECH OWL IN ONTARIO [1] [2]

N. D. MARTIN

THE EXPLANATION of dichromatism in the screech owl, *Otus asio* (Linnaeus) has eluded investigators since the species was described in 1758. While this owl is generally considered to have two colour phases, grey and rufous, or "red," the distinction between red and grey is far from standardized, and a possible third phase is often spoken of as "intermediate."

This study of the eastern screech owl, *O. a. naevius* (Gmelin), indicates that there are only two phases, red and grey, and the distinction between them is emphatic.

The relation of colour phases to sex, and the distribution of colour phases in Ontario are presented.

Mr. L. L. Snyder made available the collection of skins of the Royal Ontario Museum of Zoology, and granted advice. Other members of the Museum staff granted helpful criticism.

Definition of Colour Phases

The 93 specimens of *O. a. naevius* in the Royal Ontario Museum of Zoology collection in October, 1949 were examined to determine what constituted the red phase and what the grey. The museum specimens were placed in a row, dorsal side up, on a black-topped museum table. They were arranged in order of decreasing redness of the plumage of the back.

One gap near the red end of the series broke the gradation from extreme red to extreme grey. This gap was conspicuous. On one side of it, all specimens were distinctly red in phase. On the other, all specimens were predominantly grey. This gap represents the division between red and grey phases. In the red phase there was a gradation from strong red at one end to slightly paler red at the gap. In the grey phase there was an even gradation from grey strongly tinged with red at the gap to grey lacking any trace of red at the end of the line.

To determine the frequency of specimens having different amounts of redness, five specimens were chosen from the grey phase to form a type series representing five degrees of redness. This degree of redness is an arbitrary one. Specimens representing the five grades were chosen so that each was distinct from its neighbours in the type series, and also so that a uniform difference of redness existed between any two consecutive birds in the type series.

The red phase was then considered in the same way; it seemed justified to include two grades of redness in this phase. Two type specimens were chosen to represent these two grades. The gap between red and grey phases was considered to represent an absence of two colour grades.

The type series of seven specimens — two red, five grey — were numbered 1 and 2 in the red phase, and 5 to 9 in the grey phase. It seemed justified to consider the gap between phases as representing absence of Grades 3 and 4. Each specimen in the collection was compared with the type series, and assigned to its appropriate grade. Figure 1 shows the frequency of specimens in each grade. The division line between Grades 7 and 8 in Fig. 1 is an arbitrary one, and serves only to describe the general colouration of birds in the middle of the line-up. The birds do not group themselves around the centres of the grades, but change gradually from the red end of Grade 5 to the grey end of Grade 9.

This colour grade classification was confirmed by consultation with members of the Museum staff.

The relative frequency of screech owls in each colour grade in the Museum collection is considered to be essentially representative of frequencies in the screech owl population of Ontario. If there has been any selection by the Museum, it has been in preserving specimens of a colour intermediate between red and grey, and has been carried out on such a minor scale that Fig. 1 may, in general, represent the wild population.

Figure 1 shows that the population consists roughly of two phases, red and grey, with no complete intergradation, and no intermediate phase. About 19% of the popu-

[1] Contribution from Department of Zoology, University of Toronto, Toronto, Ontario.
[2] Received for publication May 31, 1950.

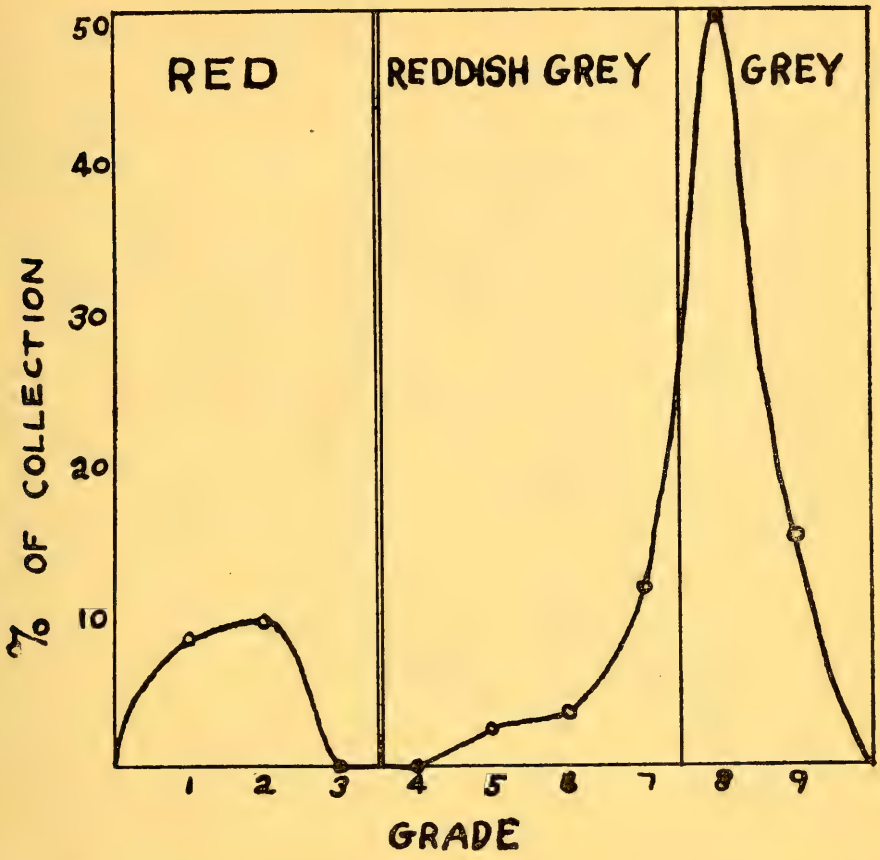

Fig. 1. Distribution of colour grades for specimens in collection of the Royal Ontario Museum of Zoology.

lation is of the red phase, and 81% of the grey phase. Only about 5% is grey with a conspicuously reddish tinge, Grades 5 and 6. Birds in Grade 7 have slight but apparent tinge of red, and compose about 12% of the population. Birds in Grades 8 and 9 show no conspicuously red shading, and comprise 64% of the Ontario population.

When treated statistically (by considering the heterozygotes to comprise Grade 5, or Grades 5 and 6, or 5, 6, and 7), these ratios do not approximate the ratios expected if red and grey phases were respective expressions of monohybrid alleles in a freely interbreeding population.

The specimens chosen as types in the R. O. M. Z. collection have the following accession numbers:

Grade 1: 67498
2: 25,10,1,21
5. 30-5-2-197
6. 29.12.11.1
7: 373 (McIlwraith tag) male, Hamilton, Collector: McIlwraith
8: 28.10.30.1
9: 31904

Relation of Colour Phase to Sex

The 75 skin specimens of *O. a naevius* in the collection of the Royal Ontario Museum of Zoology in January, 1948 were treated satistically to determine if there is any significant relationship between one colour phase and one sex. The following contingency table was used:

	Red	Grey
Male	9	33
Female	5	28

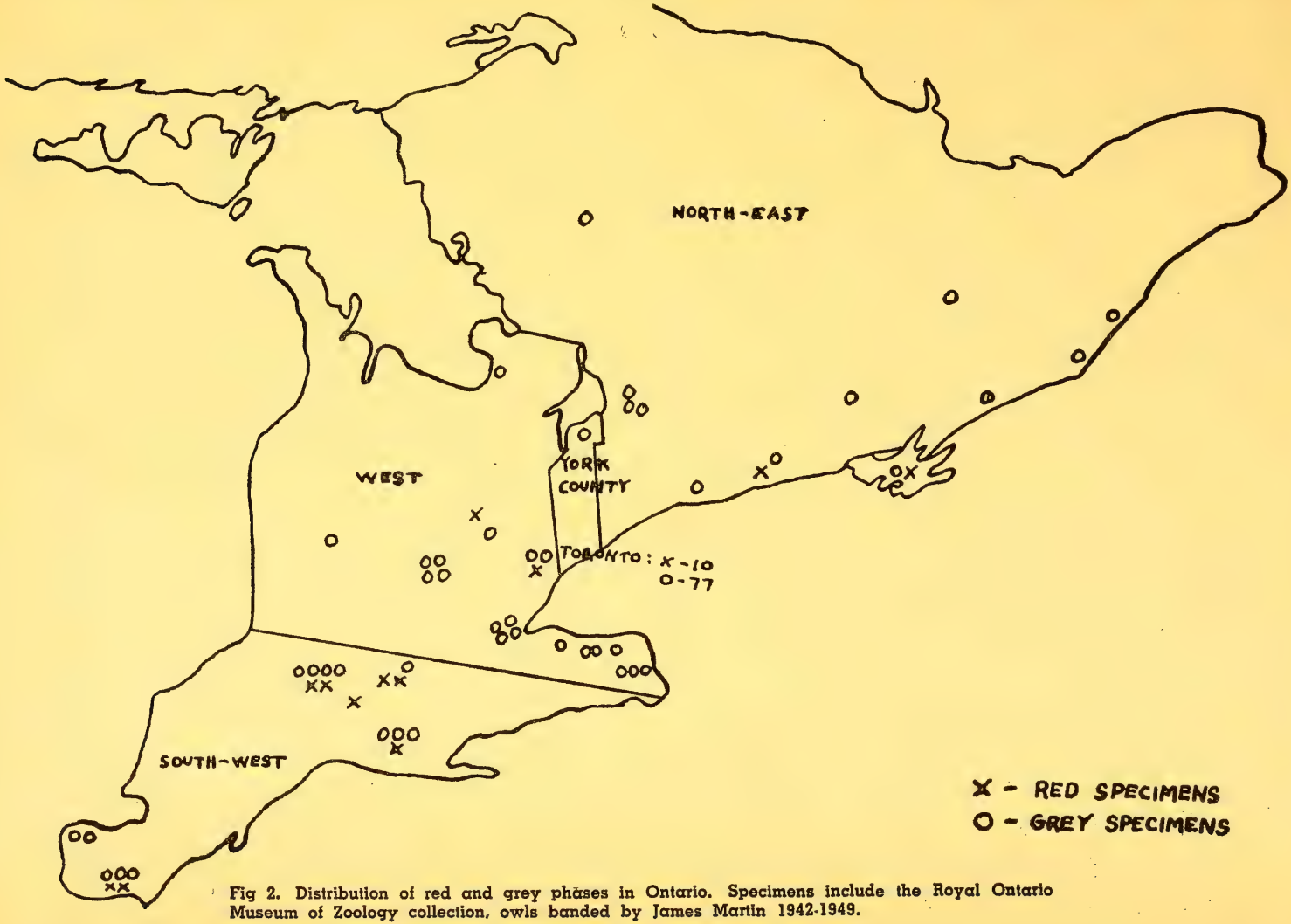

Fig 2. Distribution of red and grey phases in Ontario. Specimens include the Royal Ontario Museum of Zoology collection, owls banded by James Martin 1942-1949.

Table 1. — Composition of population of four sections of Ontario with respect to colour phases

Section of Southern Ontario	Specimens			
	Total	Red	Grey	% Red
Southwest	21	8	13	38
West	22	2	20	9
York County	88	10	78	11
Northeast	14	2	12	14
Total for Ontario	145	22	123	15

The data are the same as for Fig. 2.

There is a probability of these data, or data showing even less random distribution, occurring by chance 50% of the time. Therefore, according to these data, there is no significant relationship between colour phases and sexes.

Distribution of Colour Phases

The known range of *O. a. naevius* in Ontario includes roughly all the Province south of Highway 60, or a line drawn from Pembroke on the Ottawa River to Parry Sound on Georgian Bay, and from Lake Huron on the West to Quebec on the east.

In general, the flora and fauna of Southern Ontario show a cline from southwest to northeast: the southwestern section contains southern forms that become increasingly scarce towards the northeast. Hasbrouck (1893) and Bendire (1892) have noted that the screech owl is predominantly of the red phase in the central-eastern states. If the red phase become increasingly scarce towards the north, it might be expected to show a cline in Ontario. Figure 2 and Table 1 show that the red phase does comprise a larger part of the population in the southwestern section of the province than in any other section, but no other indication of a cline in colour phase is indicated by these data.

Figure 2 shows the geographic distribution of red and grey colour phases in Ontario. It is drawn from two sources of reliable data. Eighty-eight of the birds mapped represent the collection of the Royal Ontario Museum of Zoology, and 57 are from the bird-banding record of R. F. James, representing field work in which he collaborated with the author.

In Fig. 2 the distribution of the screech owl in Southern Ontario is divided into four sections from southwest to northeast: southwest, west, York County, and northeast. The boundary between southwest and west is drawn where there is a gap in the records. York County is separated because 61% of the records are from that county alone. The remainder of Southern Ontario comprises the northeast section.

This map probably shows the distribution of ornithologists more completely than the distribution of *O. a. naevius* in Ontario, but it is probably reliable in showing that the red phase forms a larger proportion of the screech owl population in southwestern Ontario than in the rest of the Province.

Table 1 shows the frequency of red and grey phases in each region.

Summary

1. Red and grey are the only distinct colour phases of *Otus asio naevius* (Gmelin). Ninety-three specimens in the Royal Ontario Museum of Zoology collection were classified into nine colour grades with respect to the redness of the plumage of the back. The red phase consisted of two grades, the grey of five. Two grades between red and grey had no representative specimens.
2. The red phase forms a greater proportion of the screech owl population in southwestern Ontario than in any other part of the Province.
3. There is no significant relationship between sexes and colour phases.

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THE DATES OF PUBLICATION OF THE ICONES FILICUM BY W. J. HOOKER AND R. K. GREVILLE [1, 2]

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IT IS WELL KNOWN that many of William J. Hooker's botanical publications carry on the title page a date that corresponds to the date of completion of publication rather than the actual dates of publication of the successive parts. It appears that this is also true of Hooker & Greville's Icones Filicum, a series of plates with explanatory text, containing illustrations and descriptions of a great many old and new ferns and fern allies, including quite a few that are quite familiar to field botanists of Eastern North America, such as *Nephrodium,* sive *Aspidium,* sive *Thelypteris,* sive *Dryopteris Goldiana* and others.

Although it was not possible to bring together any two of the numerous copies examined, it was noticed that they were all similar in size of page, type and color of binding and lettering on spine, as if the books had all been sold pre-bound. There is however good evidence that this work first came out in fascicles, and a more thorough search might lead to the discovery of one or more copies thus issued. The evidence that the date 1831 that appears on the title page is only the date of publication of the bound copies is as follows:

The first mention of the Icones Filicum appears in Linnaea 2: 526. 1827 where the publication of the first fascicle of 20 plates is mentioned. In the same journal vol. 3: Littb. p. 25, and vol. 4: Littb. p. 29 the next two fascicles of 20 pages each are reviewed and are said to have been published in 1827.

In the Litteraturblätter für reine und angewandte Botanik vol. 1, page 84, year 1828 (first fascicle, probably early 1828, the "Vorwort" being dated: "Zu Ende Februar 1828"), I find: "Icones filicum ..... 1827. fol. mit 20 Tafeln."

In F. Miltitz, Bibliotheca botanica, page 487, published 1828, I find: 1827 .... Icones Filicum .... I, II, III fasc. c. tab. 20, p. 20."

In the Ann. Sc. Nat. 18: Rev. Bibl. 37-38. Mars 1829 the following appears: "83. Icones Filicum ... Fasc. I-VI, 1827-1828 ..."

In the Allgemeine Litteratur Zeitung for the end of April 1830, I find a long review (pages 529 to 543) of the Icones Filicum with the following information: "... Fasc. 1-7. 1827 sq. Fol. (Jedes Heft. mit 20 Kupfern)...." This note is also reprinted in Flora 13:712, 1830. This is very definite information that the Icones Filicum were published over a period of years, starting with 1827 for the first fascicle and that, by the end of 1829 or at most early 1830, the first volume (120 plates) and the first fascicle of the second volume were already published. Most likely, fascicle 8 (plates 141 to 160) was not yet published or was being published by early 1830. Also, it will be noted that each fascicle has 20 plates.

Greville and Hooker in the Botanical Miscellany 2:360-403, published during the autumn of 1831 (see Marshall, Kew Bull., 1936:85-95. 1936), enumerate all the species of *Lycopodium* known up to that time. The Botanical Miscellany refers to all the plates of *Lycopodium* of the Icones Filicum up to plate 224 (*Lycopodium crassum* HBK.). The last two plates of *Lycopodium,* plates 227 and 233, are not cited in the Botanical Miscellany. On the other hand, the Icones Filicum does refer to the Botanical Miscellany only twice, viz., under plates 212 and 224. This is fairly good evidence that plates 201 to 225 of the Icones Filicum were proof-read approximately at the same time as pages 360-403 of volume 2 of the Botanical Miscellany, namely, autumn 1830, whereas plates 1 to 200 of the Icones Filicum were published prior to autumn 1831.

By inference from the above it seems also that the last two fascicles had 25 plates each. Then since the Bot. Misc. is not cited at plates 227 and 233, it would appear that fascicule XII was proof-read between the proof-reading and the publication of the Bot. Misc. 2: 360-403. 1.

Blume, in his Enumeratio Plantarum Javae, lists the ferns, in fascicle 2, dated 1828. This fascicle contains many references to the

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[1] Contribution No. 1035 from the Division of Botany and Plant Pathology, Science Service, Department of Agriculture, Ottawa, Canada.

[2] Received for publication June 15, 1950.

earlier plates of Hooker & Greville's Icones Filicum; the highest number cited is plate 39 (on page 270). On the other hand, Hooker & Greville do not cite Blume's Enumeratio until plate 141, after which Blume is frequently referred to. It seems that at least plates 1 to 40 of Hooker & Greville's Icones Filicum were published in 1828 or earlier, probably in 1827, whereas plates 141 to 250 of the Icones Filicum were published well after Blume's Enumeratio, probably 1829 or later. The intervening plates, 41 to 140 were probably published around 1828 or 1829.

Wallich's "Numerical list of dried specimens of plants in the Museum of the Honb. East India Company . . .", or more commonly the "Catalog", gives almost no bibliographical references, but many of the species published for the first time in the Icones Filicum are frequently and properly cited by Wallich in his Catalog. None of the Wallich's citations refer to any plate subsequent to No. 79. This one is referred to as follows: "*Botrychium lanuginosum* Wall. apud Hook. et Grev." And all these references are in the first few pages of the Catalog. Probably the first part of the Catalog was substantially ready for publication by December 1st, 1828, and was certainly published by December, 1829, as can be derived by Wallich's prefaces to the various parts of the Catalog. Hooker & Greville, in the Icones Filicum, regularly cite Wallich's nomina nuda as "Wallich MSS" up to plate 158, but starting with plate 161, full references to Wallich's Catalog are regularly given. From that I would conclude that plates 1 to 80 of the Icones Filicum were probably published by December 1st, 1828; that plates 80 to 160 were published at about the same time as Wallich's Catalog, probably in 1829, with some of them published perhaps as early as late 1828 or as late as early 1830; and that plates 161 to 260 were published after the catalog, some of them perhaps as early as late 1829, but most, if not all, in 1830 or later.

It will be noted that the above contains very little absolute evidence, but, on the other hand, there is no discrepancy between the various conclusions drawn from eleven so diverse sources. I am therefore inclined to think that the dates arrived at are a fairly good approximation of the actual dates of publication.

In Pritzel I find "Icones Filicum, volume 1, plates 1-120, 1829; volume 2, plates 121-250, 1831", which I take to mean that the publication of the first and second volumes of the Icones Filicum was complete by 1829 and 1831 respectively. Pritzel does not give the source of his information and it seems that it must have been much less definite than what has just been listed.

The only bit of conflicting evidence comes from Christensen, Index Filicum, p. 706, 1906. Without specifying the source of his information, he states: "Icones Filicum — t. 1-60:1827. — t. 61-120:1828 (?) — t. 121-180: 1829. — t. 181-240: 1930-31. In so far as I do not know and cannot check the sources of Christensen's information, I find it difficult to accept his opinion at face value as it conflicts with so many of the probable dates arrived at from a variety of other sources. In particular, I find no evidence that fascicles VIII and IX were published as early as 1829.

To summarize, I consider that, until more evidence is available, the Icones Filicum of Hooker and Greville were probably published in the following years:

Volume I						**Probable date**
Fascicle	I	plates	1-20	with	text	1827
"	II	"	21-40	"	"	1827
"	III	"	41-60	"	"	1827
"	IV	"	61-80	"	"	1828
"	V	"	81-100	"	"	1828
"	VI	"	101-120	"	"	1828

Volume II						**Probable date**
Fascicle	VII	plates	121-140	with	text	1829
"	VIII	"	141-160	"	"	early 1830 ?
"	IX	"	161-180	"	"	1830 ?
"	X	"	181-200	"	"	1830 to summer 1831
"	XI	"	201-225	"	"	Fall 1831
"	XII	"	226-250	"	"	(Dec. ?) 1831

This table of dates of publication does not take into account the dates given by Christensen.

To the late Prof. C. A. Weatherby and Dr. Bernice Schubert, of the Gray Herbarium of Harvard University, to Mr. F. Ballard of the Kew Gardens and to Mr. A. H. G. Alston of the British Museum, I extend my sincere thanks for help and suggestions in carrying out this bibliographical study.

H. B. CONOVER'S BIRD WORK IN YUKON [1]

A. L. RAND
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IN GOING OVER the papers of the late H. B. Conover of Chicago, I found diaries of his 1919 and 1920 hunting trips to Yukon. Yukon Territory, Canada, has long been celebrated as a hunting field, and perhaps many of the big game hunters have collected some bird specimens that are scattered through many museums. Though Conover's 1919 trip was primarily for big game and yielded few birds, his 1920 trip was undertaken shortly after his return from a collecting trip to Venezuela for the then Field Museum, on which he accompanied W. H. Osgood. This was at the time he became seriously interested in building up a world-wide collection of game birds, and this quickening interest in game birds is indicated by the increased amount of notes on game birds on this second trip and a collection of about 100 specimens.

In my "List of Yukon Birds, etc." published in 1946 (Nat. Mus. Can., Bull 105) I had no information on Conover's Yukon bird work, and these notes may be considered a supplement to that work.

In 1919 Conover, with an outfitter and two guides, by canoe went up the Nisutlin River (leaving Teslin Post August 1) to the mouth of Wolf River (August 1); up the Wolf River to the junction of the Little Wolf and Red Rivers which latter is the more northerly tributary (August 8); and up the Little Wolf River to Wolf Lake (arriving August 11). He hunted the Wolf Lake area August 11 — September 9 for big game, and shot a few ducks and ptarmigan. On September 10 he started back down the Little Wolf River and reached Teslin Post September 12, where he stayed until September 17. He left the post September 17; reached Teslin River September 18 and hunted in the nearby mountains until he returned to Teslin Post October 1. He stayed there until October 5, then went to Hootalinqua, where he arrived October 10 and took a river steamer October 12 for Whitehorse.

Though Conover's 1919 notes are full of reference to game birds seen, and some skinned, and part of his time at Teslin Lake was spent shooting birds, only one of his skins, that of a willow ptarmigan, survived and is now in his collection.

In 1920 Conover made a hunting trip to the Big Salmon River — Rose River country by packhorse, and then shot ducks on Lake Marsh, and hunted the country around Lake Bennett and Watson River. He arrived at Whitehorse August 3; with guide went by river boat to Hootalinqua arriving August 5; August 8 reached Winter Crossing [2] by canoe where they met their outfit of 9 horses and 2 men. They arrived at Livingston, on Livingston Creek on August 10.

The period August 12 to September 1 was spent in the sheep ranges with peaks 4000-6500 feet in altitude (estimated) between the headwaters of the Big Salmon and the headwaters of the Rose River. September 2 camp was made at the headwaters of the Rose River, among the little lakes and ponds of what was evidently the Rose-Lapie Pass and September 3 and 4 were spent there. On September 5 the party started back reaching Big Salmon Lake on September 7, and September 8-12 was spent hunting about Big Salmon and Quiet Lake. September 13 they started for Livingston which they reached September 18, and Winter Crossing September 21. Here apparently the pack outfit was left, and by boat Conover went to Lake Laberge where he shot on September 22, 23; Lake Marsh, October 1-11; Lake Bennett, October 11, and hunted Watson River, October 23 — November 8. No journal covers this period, but I have the catalogue of specimens collected and the list of game birds shot.

[1] Received for publication July 17, 1950.

[2] In 1946 I identified "Winter Crossing" as probably referring to Yukon Crossing, near Carmacks. Probably there are several Winter Crossings on the Yukon River. The present one is 40 miles above Hootalinqua on the Teslin River.

Though this 1920 trip also was ostensibly a big game trip, Conover devoted much time to game birds as his notes indicate, and he made a collection that numbers 103 specimens entered in his catalogue.

Comments on the Data

Conover's notes and catalogues deal almost entirely with game birds, and part of the time at least he recorded daily all the game species seen. Numbers of individuals are seldom given, but from the incidental comments some idea of abundance can be secured.

The chief value of these notes perhaps is that they give a picture, sketchy though it is, of the game bird situation in parts of southern Yukon from which we had no data for any period.

Discussion of the Game Birds in the Area

At Teslin Bay on several days between September 12 and October 5 Conover found considerable numbers of ducks and geese, and swans stopped there. Between Teslin Lake and Wolf Lake, along the Nisutlin, Wolf and Little Wolf Rivers, August 2-11, only occasional ducks: whistlers, pintail, 1 flock of 100 Canada geese, mallards, green-winged teal and mergansers were seen, and there was apparently no concentration of waterfowl. Lesser yellow-legs and solitary sandpipers were also recorded, and on 3 days spruce grouse were seen. On the return trip, August 26-27 and September 9-12, only a few widgeon and a brood of harlequins were noted.

At Wolf Lake, between August 11 and 26, Conover records that many ducks were found on a bay they called Duck Bay, including pintail, green-winged teal, baldpate, golden-eye, buffle-head. Though ducks were more numerous than elsewhere, as Conover speaks of 20 ducks seen on the lake one day, the total number of ducks evidently was not large. A semipalmated plover, many lesser yellow-legs, and a few Wilson snipe were also seen here. Hunting for sheep and caribou in the surrounding mountains a few rock and white-tailed ptarmigan were found, and on the island in Wolf Lake were a flock of willow ptarmigan. Near the mouth of the Little Wolf River, was a small lake called Fish Lake. Here about 50 surf scoters were seen.

At the outlet of Teslin Lake October 6, there were quite a few geese and ducks, including whistlers, scaup, and mallards. Travelling down the Teslin River, October 8-10 quite a few ducks were seen, mostly whistlers, with mallards the next most common.

In the mountains about the foot of Teslin Lake September 19-29 only a few rock ptarmigan (on 2 days), willow ptarmigan (1 day) and spruce grouse (on 2 days) were seen.

In the Big Salmon River country, along the valleys of the river and its tributaries, only a few broods of harlequin ducks were seen; in the forests occasional blue and spruce grouse, and at timberline willow ptarmigan were seen August 10-15 and September 13-18. In the mountains between Big Salmon Lake and Rose Lake, August 16 — September 7, one brood of harlequins were recorded, and willow ptarmigan on 6 occasions; white-tailed ptarmigan, 2 coveys; spruce grouse, 1 covey; and rock ptarmigan, twice. One Wilson snipe was also seen. About the little lakes at the head of Rose River Conover on September 4 found 4 golden-eye and 5 green-winged teal only.

About Big Salmon Lake, Quiet Lake, and the few miles of water between, September 8-12 Conover found a few harlequins, 1 bunch of baldpates, some golden-eyes, mallards and buffle-heads, and saw two scaup and 2 surf scoters.

From the above it is seen that about Wolf Lake, Rose Lakes, and Big Salmon-Quiet Lake a few duck summer. Along most of the streams are only a few harlequin ducks breeding. Only in Teslin Bay, and at the foot of Teslin Lake are areas where ducks and geese stop in some numbers.

For Marsh Lake we have no field notes, but we do have a bag record, which has totals for the period October 1-8 (8 days of shooting) as follows:

lesser scaup	42	birds
golden-eye (2 species)	35	"
buffle-head	26	"
pintail	11	"
mallard	10	"
greater scaup	10	"
baldpate	8	"
surf scoter	3	"
white-winged scoter	2	"
old-squaw	2	"
red-breasted merganser	2	"
ring-necked duck	1	"
Total	152	birds

Whistling Swan.

Cygnus columbianus (Ord). Swans were reported only three times, all in 1919: on

October 3 there was a flock of about 100 in Nisutlin Bay; on October 5 swans were seen flying high over Lake Teslin, and on October 8 a flock of 15 was seen on Teslin River.

Lesser Canada Goose.

Branta canadensis leucopareia (Brandt). Apparently a few geese summer on Wolf River, where on August 5 a flock of about 100 birds, mostly unable to fly, was seen, and another flock on August 6, and on Wolf Lake, where a few were seen on August 21. Geese apparently stop in the autumn in Nisutlin Bay, where about 50 were seen on October 3, and 400 on October 4. A few geese were seen at the foot of Teslin Lake on October 6.

Common Mallard.

Anas platyrhynchos platyrhynchos Linnaeus. In 1919 a very few mallards were seen along the Wolf River, including one flock of young unable to fly on August 6; a few were seen in Nisutlin Bay October 6 and 8, and at the foot of Teslin Lake and in Teslin River, October 9-13 there were quite a few ducks, among which the mallards were outnumbered only by the golden-eyes.

In 1920 mallards are recorded only at Big Salmon Lake, where a few were seen, September 8-12, and at Lake Marsh, where some were shot, October 1-8, the largest day's bag being 7 birds.

Green-winged Teal.

Anas carolinensis Gmelin. Along the Wolf River seen, August 6-8; and at Wolf Lake, August 12-25, and in Nisutlin Bay, September 13-14, 1919. In the Big Salmon River—Rose Lake country only 5 teal were seen, on a pond near Rose Lake on September 4, 1920. At Marsh Lake, October 1-8, 1920, no green-winged teal were shot.

American Pintail.

Anas acuta tzitzihoa Vieillot. Along the Wolf River seen August 5-10; at Wolf Lake, August 11-25; at Nisutlin Bay, September 12; and on Teslin River, October 11, 1921.

In the Big Salmon—Rose Lake area no pintail were recorded in 1920. Shooting at Lake Marsh, in October pintail were shot on only October 1 and 2, when 11 birds in all were killed.

Baldpate.

Mareca americana (Gmelin). Wolf River, seen on August 24, 25 and September 11; and at Nisutlin Bay two were shot on September 14 and a few seen on October 3, 1919.

In the Big Salmon River—Rose Lake country only one bunch of widgeon were recorded, on September 12, 1920. During the period shooting on Lake Marsh baldpate were shot on October 1 (2 birds) and on October 2 (6 birds).

Specimen:

Marsh Lake: 1♀; October 1, 1920.

Canvas-back Duck.

Aythya valisineria Wilson. The only previously published Yukon record is of the two birds I saw on June 16, 1944 on a marshy lake in the Pelly River Valley. Conover adds another sight record, of a flock of 15 seen in Nisutlin Bay on October 4, 1919.

Ring-necked Duck.

Aythya collaris (Donovan). The specimen listed below is the first Yukon record for this more southern duck. Presumably it is not of regular nor common occurrence.

Specimen:

Lake Marsh: 1♀; October 5, 1920.

This specimen compares well with females from various other parts of North America.

American Greater Scaup Duck.

Aythya marila nearctica Stejneger. The only specimen hitherto recorded for Yukon was Nelson's from Fort Reliance. Though there have been a number of sight records, Swarth in 1927 was unwilling to accept any for the Atlin area because all the specimens he secured were lesser scaup.

Because of the known distribution of the greater scaup it would be surprising if they did not occur, and Conover's specimens listed below are thus particularly welcome. In addition to the specimens, Conover records shooting two greater scaup near the outlet to Teslin Lake on October 6, 1919 and another on October 8, and in 1920 on Lake Marsh shooting 1, 2, 3, 4 and 1 greater scaup on October 4, 5, 6, 8 and 11. Possibly they are all migrants in southern Yukon.

Specimens:

Lake Marsh: 2♂, 2♀; October 4-11, 1920.

Wing, ♂ 220, 222; ♀ 208, 217; exposed culmen ♂ 46, 46, ♀ 43, 44; greatest width of bill ♂ 23, 24; ♀ 23, 26 mm. The males are just beginning to get vermiculated feathers in their backs.

Lesser Scaup Duck.

Aythya affinis Eyton. Strangely no scaup were recorded on the Wolf River or Wolf Lake area, and only on Nisutlin Bay and Teslin Lake, October 1 and 3, 1919, were a few

scaup, that could well have included this species, recorded, and 1 lesser scaup was shot in Nisutlin Bay on October 8, 1919.

In the Big Salmon River—Rose Lake area the only scaup recorded are two on September 8, 1920 at Big Salmon Lake which were probably of this species. While shooting at Lake Marsh, in 1920 this was apparently one of the commonest ducks, and 2, 4, 19, 2 and 15 birds were shot on October 3, 5, 6, 7 and 8.

Specimens:

Lake Marsh: 1 ♂ immature, 1 ♀; October 3, 5, 1920.

Wing ♂ 201, ♀ 181; exposed culmen ♂ 37, ♀ 38; greatest width of bill, ♂ 19, ♀ 16 mm.

American Common Golden-eye.

Bucephala[3] *clangula americana* (Bonaparte). In 1946 I had but a single record of this species for Yukon. Conover recorded various golden-eyes seen in Yukon, which are listed under the next species, but he collected the specimens of this species listed below. Its summer and breeding status in Yukon is unknown.

Specimens:

Lake Marsh: 3 ♂, 6 ♀; October 2-7, 1920. One male is in partial plumage; the other two are in female plumage. All these birds have the straight sided bill with the flat nail of this species.

Barrow Golden-eye.

Bucephala[3] *islandica* (Gmelin). As this species is known to be a fairly common summer resident in southern Yukon I have listed Conover's sight records here.

In 1919, on the Nisutlin River, August 1, one brood was seen, and a flock on the Wolf River, August 4; on Wolf Lake one was seen on August 21, and a brood on August 25. In Nisutlin Bay, August 4, there were quite a few, and at the outlet to Teslin Lake, October 6-8 there were quite a few ducks, mostly golden-eyes.

In 1920 four were recorded on a pond at the head of Rose River, September 4, and "some" on Big Salmon Lake—Quiet Lake on September 12.

While shooting on Lake Marsh golden-eyes of two species were shot as follows: 1, 2, 13, 4, and 8 on October 1, 4, 5, 7, and 8. Apparently these were amongst the commonest ducks there.

[3] For reasons for using Bucephala instead of Glaucionetta as the genus for the golden-eye and buffle-head see 1948, Auk, 65, p. 439.

Specimens:

Rose River headwaters: 3 ♀; September 4, 1920.

Lake Marsh: 4 ♂ imm., 2 ♀; October 4, 5, 1920. These all have the tapering bill and arched nail of this species.

Buffle-head Duck.

Bucephala[3] *albeola* (Linnaeus). In 1919 buffle-heads were recorded only on August 25 at Wolf Lake, in Nisutlin Bay on October 8, and Teslin River, October 9 and 10. In 1920 recorded at Big Salmon—Quiet Lakes, September 8 and 12, and when shooting on Lake Marsh birds were taken as follows: 1, 1, 5, 10, 5, 2 and 2 on Oct. 2, 3, 4, 5, 6, 7 and 8th.

Specimens:

Head Big Salmon River: 2 ♀; September 12, 1920.

Lake Marsh: 1 ♂; October 2, 1920.

Old-squaw Duck.

Clangula hyemalis (Linnaeus). When I compiled my 1946 list I had not a single interior record, nor knew of a specimen from Yukon despite the species being reported to summer in abundance on the Arctic coast.

Conover collected the specimens listed on October 6, and also shot another on Lake Marsh on October 8, 1920.

Specimens:

Lake Marsh: 1 ♂ imm.; October 6, 1920.

Western Harlequin Duck.

Histrionicus histrionicus pacificus Brooks. In 1919 Conover recorded a female with 4 half grown young on August 27 on the Wolf River, and shot one on Teslin River, on October 10. In 1920 on streams in the Big Salmon—Rose Lake area he recorded broods of young on August 12, 14 and 19, and September 7, while on September 12, on Big Salmon Lake—Quiet Lake waters he saw three harlequin ducks.

None was recorded for Lake Teslin or Lake Marsh.

Specimens:

Headwaters Big Salmon River: 2 ♂, imm., 3 ♀; August 14—September 12.

The August 18 immature male is about two-thirds grown, and still has much down on the neck.

King Eider.

Somateria spectabilis (Linnaeus). In my 1946 list I had but a single interior Yukon station for this bird, two birds from the Yukon River near Dawson. The Conover specimen listed below thus gives the second interior locality for the species.

Specimen:
Lake Marsh: 1 ♂ imm.; October 7, 1920.

Western White-winged Scoter.

Melanitta fusca dixoni (Brooks). Conover records this bird only from Lake Marsh, where he shot single individuals on October 4 and 6, 1920.

Specimens:
Lake Marsh: 1 ♀; October 4, 1920.

Surf Scoter.

Melanitta perspicillata (Linnaeus). In 1919, on a small lake called Fish Lake near where the Little Wolf River and the Red River join to form the Wolf River, Conover found about 50 surf scoters on August 28. Later, on October 1 in Nisutlin Bay he recorded many scoters, and the one shot was this species.

In 1920, two were recorded on September 8 on Big Salmon Lake. While shooting on Lake Marsh surf scoters were taken as follows: 1 and 2 birds on October 1 and 7.

Specimens:
Head Big Salmon River: 1 ♀; September 8, 1920.

Red-breasted Merganser.

Mergus serrator Linnaeus. In 1919 recorded only on Wolf River, August 6 and 8 (species ?). In 1920 while shooting at Lake Marsh one was taken on October 1, and another on October 7, both identified in Conover's notes as this species.

Specimen:
Lake Marsh: 1 ♀; October 7, 1920.

Richardson Blue Grouse.

Dendragapus obscurus richardsonii Douglas. No blue grouse were recorded in 1919; in 1920 a covey of young grouse was seen on the headwaters of the Big Salmon River on August 12, and single birds are entered for Livingston, August 10, Lake Laberge, September 22, and 3 for Lake Bennett, October 11. Evidently it was scarce and local, as appears to be the case generally.

Conover has the following notes on this species, apparently gathered in part from conversation with local people: "Found in July and August around shores of lakes. In September works up mountains to timberline where it winters. In fall seems to like to feed on a red berry locally known as "pigeon berry". Holds generally higher than either ruffed or spruce grouse. Found broods of half-grown young middle of August in high valleys, but not up to timberline. Very tame, treeing on being flushed and allowing close approach. Tamer than either of other two grouse", the spruce and the ruffed grouse.

Specimens:
Carcross: 1 ♂ ad., 1 ♀ ad.; October 11, 1920.
Lake Laberge: 1 ♂ ad.; September 22, 1920.
Livingston Creek: 1 ♀ juv.; August 12, 1920.

Alaska Spruce Grouse.

Canachites canadensis osgoodi Bishop. As would be expected, spruce grouse were noted sparingly throughout when in forest country. Conover's notes, evidently gathered in part from local people read: "Found in spruce timber and also in jack pine but not as commonly as in spruce. Most common of [the] three grouse [the others are the blue and ruffed grouse]. A swampy spot overgrown with spruce is a good place for them. Generally tame, treeing when flushed, but sometimes very wild. One killed in September had crop full of jack pine buds. Never seem to taste bitter; drier and flavor nowhere near as good as blue or ruffed grouse. Meat black".

Specimens:
Winter Crossing (on Teslin River): 1 ♂ ad.; 1 ♂ imm.; 2 ♀; August 9, September 21, 1920.
Headwaters Big Salmon River: 1 ♂; September 13, 1920.
Livingston: 1 ♂ ad., 2 ♀; August 10, September 18, 19, 1920.
Head McConnell River: 1 ♂ imm.; 3 ♀; August 26, 1920.

Yukon Ruffed Grouse.

Bonasa umbellus yukonensis Grinnell. None was recorded in 1919; in 1920, 2 are recorded near Winter Crossing on Teslin River, and 1 at Lake Laberge, Conover's notes read: "Found in poplar groves along banks of rivers or lakes. — Don't tree, and are hard to flush as they are great runners and sneakers."

Specimens:
Winter Crossing, Teslin River: 1 ♂, 1 ♀ September 19, 1920.
Lake Laberge: 1 ♀; September 23, 1920.

Black-shafted Willow Ptarmigan.

Lagopus lagopus lagopus (Linnaeus). Found in small numbers in autumn in Wolf Lake, Big Salmon Lake—Rose Lake, foot of Teslin Lake, Lake Bennett, and Watson River areas. Conover's notes read: "Most common of the three ptarmigan. Lives in willows generally just around or above timberline, but also found in high valleys well down

below timberline. — [near Rose Lake] — saw them in valley eight hundred feet below timberline and on Wolf Lake found a large covey on a small island in the lake. Island was mostly all willow, and only hundred yards from nearest shore, but shores were heavily timbered. —. In summer have also seen them well up toward tops of mountains — where there was willow. Meat dark and very dry."

Specimens:

Wolf Lake: 1 ♂, August 13, 1919.
Big Salmon—Rose Lake area; 1 ♂, 5 ♀, August 13—September 16, 1920.
Watson River: 2♂, October 23, November 8, 1920.

Southern Rock Ptarmigan.

Lagopus mutus kelloggae Grinnell. Small numbers occasionally recorded in the higher Wolf Lake country; above the foot of Teslin Lake, between Big Salmon and Rose Lake, and in Watson River country. Conover's notes follow: "Probably little more common generally than white-tailed but in 1919 and 1920 not very plentiful. In summer found on top of flat grassy mountains. Does not seem to like the rocky ones as well as the grassy flat ones. Good ewe ranges are good rock ptarmigan country. In winter seems to hold to about the same country, maybe working down closer to the willow line but holding higher than either of the two others. Sometimes very tame and others very wild. Single birds in summer apt to be very wild. Meat black but not as dry as willow ptarmigan."

Specimens:

Headwaters Big Salmon River—Rose Lake: 7 ♂, 3 ♀; September 2-15, 1920.
Head of Watson River: 1 ♂, November 4, 1920.

White-tailed Ptarmigan.

Lagopus leucurus subsp. ? Two coveys, one of 4 and one of two birds recorded in the Wolf Lake area; two coveys seen one day in the Big Salmon — Rose Lake area; and collected in Watson River country.

Conover's notes follow: "Holds in summer to the very tops of the roughest peaks. Delights in the slide rock slopes of these peaks. Ram mountains are generally good white-tailed country [this does not accord with my own observations; in summer most of them, especially females with young, are on grassy meadows at timberline]. Very tame. Walked into bunch in slide rock before seeing them and they only ran a few steps. In winter comes down into the hollows in the high draws, holding lower than the rock ptarmigan in that season. Still tame but apt to be wilder than in summer. — Best eating of the three ptarmigan, meat being black but juicy."

Specimens:

Head McConnell River (6200 feet): 3 ♂, 7 ♀; August 24, 1920.
Head Watson River: 1 ♂, 2 ♀; October 30, 1920.

These birds are much greyer than is a single Jasper bird in the Conover collection. In my 1946 list I noted the same considerable difference between Yukon and Jasper birds (topotypical *leucurus*) in the National Museum of Canada, and referred the Yukon birds to *peninsularis*. However, I had seen no Kenai birds (topotypical *peninsularis*) and was guided in this allocation by the description. Friedmann (1946, U.S. Nat. Mus. Bull., **50**, p. 129) refers Yukon birds to *P. l. leucurus*. A revision of this part of the species seem advisable.

Little Brown Sandhill Crane.

Grus canadensis canadensis Linnaeus. Near Rose Lake on September 4 six were seen flying over, and again on September 5, 1920, a flock of 100 passed.

Wilson Snipe.

Capella gallinago delicata (Ord.). Only at Wolf Lake on August 12, 1919, did Conover record "quite a few". Otherwise single birds were recorded on September 1 between Big Salmon and Rose Lake; October 2, 4 and 5 on Lake Marsh.

Specimens:

Lake Marsh: 1 ♂, 1 ♀; October 2, 5, 1920.

Red Phalarope.

Phalaropus fulicarius (Linnaeus). Though not recorded in Yukon this species is to be expected. Conover shot three phalaropes in grey plumage out of a flock on October 6, 1919 at the outlet of Teslin Lake. Though the specimens were lost, as Conover mentions their bills being broad one can reasonably assume they were this species.

Upland Plover.

Bartramia longicauda (Bechstein). One was collected and another seen, on August 16, 1920 above timberline in the mountains above the headwaters of the Big Salmon River.

Specimens:

Headwaters Big Salmon River: 1 ♂ ?; August 16, 1920.

Pectoral Sandpiper.

Erolia melanotos Vieillot. The scant knowledge of the occurrence of this species in southern Yukon is added to by Conover's 1920 notes of birds as follows: September 14, 2 birds, Nisutlin Bay; and October 1, 2 birds and October 6, 2 birds at Lake Marsh.

Specimen:

Lake Marsh: 1 ♂; October 6, 1920.

REVIEWS

Annual Report for 1948 of the Province of Quebec Society for the Protection of Birds, Inc., Montreal, P.Q., pp. 1-41.

This summarizes the results of the 1948 bird observations by members of the Province of Quebec Society for the Protection of Birds in southern Quebec province. The information is presented in (1) an annotated list; (2) a table of bird migratory movements showing first, last, and peak dates; and (3) a summary by L. McI. Terrill of 14 Christmas bird censuses (1935-1948) made in the Montreal district. As is usual in these reports comments on temperature and precipitation are made and some phenological data are given. — W. EARL GODFREY.

W. E. Saunders, Naturalist. *R. J. Rutter, Editor; The Federation of Ontario Naturalists, Toronto, 1949; pp. I-IV, 1-66, 5 photos.*

This little volume, a memorial to the late William Edwin Saunders, is made up of essays written by naturalists who were fortunate enough to know him well: R. J. Rutter, John Dearness, the late P. A. Taverner, J. R. Dymond, J. L. Baillie, Jr., and R. G. Dingman. These essays, together with several written by Saunders himself, give an informal picture of this unusual man who was able at once to run a thriving business, take major parts in civic and church affairs, and still find time to acquire an expert's knowledge and standing in such fields as ornithology, mammalogy, botany, and entomology. His imposing bibliography, which is included in the volume, comprises some 279 titles. Dr. Saunders was an outstanding example of the school of broad-interest naturalists whose members are passing with regrettable rapidity and, in these days of specialization, with few replacements. — W. EARL GODFREY.

An Annotated List of the Birds of the East Kootenay, British Columbia. *By Walter B. Johnstone. British Columbia Provincial Museum, Occasional Paper No. 7; December, 1949; 87 pp., 20 figs., 1 map. (Price, 75c).*

This is a worthwhile contribution to the ornithology of the East Kootenay, British Columbia, the results of field work carried on by the author intermittently in the period February 1937 to June 1949. The author recognizes for biotic areas, outlines their salient characteristicts, and succinctly but adequately describes the physiography of the region. Data contained in the annotated list are grouped under categories similar to those so admirably used by Munro and Cowan (1947, B.C. Prov. Mus., Spec. Pub. No. 2, pp. 43-237). There is for each species a general statement of status. This is followed by seasonally grouped data and in the case of breeding species there is usually a detailed account of nesting. Some very interesting notes on other aspects of bird behavior are included.

There are a few minor points upon which one might comment, chiefly because they might easily have been averted. Apparently the author did not have access to the latest supplements to the A. O. U. Checklist and presumably he followed the nomenclature used by Munro and Cowan (loc. cit.) — even to the point of perpetuating certain typographical errors (e.g. spelling of *suckleyi* and Friedmann). However, many important changes have been made in nomenclature since the appearance of that excellent publication and authors of ornithological papers would be well advised to keep abreast of these.

The author appears to have relied almost entirely upon his own careful observations in compiling this impressive list of the birds of the East Kootenay region. It seems possible that an exhaustive perusal of the literature might have added perhaps a few more species. *Parus hudsonicus columbianus* comes to mind as missing from the list despite the fact that the type locality (Field) of that subspecies is in the northern part of the area concerned! These are small things, however, and it is felt that the author has well attained his stated objective of recording the bird fauna, not hitherto fully reported upon, of that section of southeastern British Columbia. — W. EARL GODFREY.

NOTES AND OBSERVATIONS

Florida Gallinule, *Gallinula chloropus cachinnans,* **in Thunder Bay District.** — On May 8, 1950 a bird of this species was found in an apparently exhausted condition at Gurney, on the north shore of Lake Superior, about 90 miles east of Port Arthur. It was found by a resort owner who tried to keep it alive, but it died on May 11 and came into the hands of Mr. W. Bittle, a Conservation Officer who forwarded it to me. It is now in the Royal Ontario Museum of Zoology. This is a new record for this district and would appear to be unusually far north. — L. S. DEAR, Port Arthur, Ont.

The Burrowing Owl in Alberta. — Upon my arrival at Rosebud, Alberta, in 1928 I received reports of little long-legged owls which used to sit about on the ground. No one had seen them for several years and although I was on the alert I saw no sign of the burrowing owl until 1938 when I found a dead one tied to a fence about 20 miles south of Rosebud. In 1939 two or three pairs nested around Rosebud and during the following years burrowing owls were found nesting as far west as Calgary and as far north as Munson. From the facts it appeared that this was a secondary incursion into central Alberta and that its northerly limit was near Munson.

When a ten year old boy, David Hitchin, reported to a meeting of the Edmonton Bird Club that he had captured a burrowing owl about 30 miles east of Edmonton there was some scepticism. This was dispelled at a later meeting by the display of the mounted specimen. The bird was captured by hand near Cooking Lake on October 5, 1949. It had apparently been shot and left with both wings broken. The following day it died. It appears to be a young of the year and may have been on one of those pre-migratory peregrinations which commonly break up the families of both owls and hawks. In any case the specimen now constitutes our most northerly record of the species. — W. RAY SALT, Dept. of Anatomy, Univ. of Alberta, Edmonton, Alta.

Belated Swallows in the Maritimes. — The fall of 1948 saw many swallows in the Maritime Provinces of Canada long after the normal date of migration. It seems desirable to put some of these reports on record as they show that more than a few isolated swallows were involved.

The following records, all for Barn Swallows, have been forwarded to me from various parts of New Brunswick.

On November 8, 1948, Stanley Gorham saw two Barn Swallows at Browns Flats, Kings County.

Henrik Deichman saw one Barn Swallow at Summerville, Kings County, November 11, 1948.

On November 13, 1948, Miss Willa MacCoubrey reported four Barn Swallows at St. Andrews.

George Boyer saw an unstated number of Barn Swallows at Memramcook, Westmorland County, December 3, 1948. This report has already been published (Audubon Field Notes 3:5).

At Cape Spencer, St. John County, the lightkeeper, Charles O. Mitchell, reported a flock of fifteen Barn Swallows seen almost daily until February 13, 1949. What they could feed on at this season is hard to imagine but the lightkeeper reported that when his children collected dormant flies in the attic and dropped them out of an upstairs window the Swallows caught them in mid-air.

The Barn Swallow normally leaves New Brunswick about the second week of September. September 29, 1892, when J. W. Banks saw one at Saint John, was always considered an unusually late date for this species.

Two November records have been reported for other years. Reid McManus Jr. (Auk 49:222) saw one at Memramcook November 8 and 9, 1931, and Ernest Joy (Pettingill, Proc. N.S. Inst. Sci. 19:354) saw one at Kent Island November 9, 1935. These two isolated reports could have been attributed to injured birds which had managed to survive but the number of late records in 1948 demands some other explanation. — W. AUSTIN SQUIRES, Curator, Natural Science Department, The New Brunswick Museum, Saint John, N.B.

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